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Rossiter W. Raymond

The celebration of Doctor Raymond's 70th birthday makes an appropriate occasion for the JOURNAL to express its appreciation of the high services that in a professional career of nearly 50 years he has rendered to the mining industry of the world, its recognition of his help in advancing the standing of the profession of mining and metallurgical engineering, and finally its own respect that is due to him as a father, because, although he was not the first editor of the JOURNAL, it was certainly he who shaped its editorial policy into that form which has come down as tradition and precedent. Raymond became editor of the JOURNAL on July 13, 1867, and continued in that position until 1874, when the multiplication of his other duties necessitated his withdrawal from sole editorial control. He became, then, joint editor with R. P. Rothwell, this arrangement extending into the '80s, and finally a special contributor. Up to the present time no volume of the JOURNAL has ever been published which has not contained some contribution by him.

The major portion of Raymond's sole editorship of the JOURNAL was contemporaneous with his filling of the position of U. S. Mineral Commissioner, and during that time he produced those wonderful volumes upon the mineral resources west of the Rocky mountains, which are the admiration of everyone who has had occasion to study them. Respecting them, the present editor of the JOURNAL can speak with peculiar appreciation, because of the minute examination of them that was necessary in connection with a historical investigation. No one better than he can praise the beauty of their style, their language always clear, incisive and easily flowing, the accuracy of the descriptions, the keenness of the perception manifested throughout, and the remarkable prophecies that had to await only a few years for their fulfillment. Written 40 years ago, when the Pacific railway had just been completed. and the Great American Desert was receiving the first strokes of development, especially as to its mining industry, these volumes can be read with almost as much interest today as when they were penned, and they may be read also with profit. No other country possesses such a chronicle of the development of its mining industry, and we may rightly esteem these volumes as classics of mining literature.

In his subsequent career as secretary of the American Institute of Mining Engineers, Raymond has added to the archives of mining and metallurgy more than any other one man, not so much by his personal contributions, although they have been important, always valuable and always highly appreciated, but as the extractor and the producer of the records, views and opinions of other men, who have done things. The profession which has witnessed and valued the results has perhaps had but scant appreciation of the thoughtfulness and tireless energy that have drawn out these contributions and have smoothed them into the clear and creditable essays and monographs of which the authors have been proud.

Doctor Raymond remarked last Saturday evening that he had not done those things that he had in mind to do and wanted to do, fate having directed his activity into

other channels, but as it was decreed he set his hand to the plow and has had joy in his work. This is the principal thing, because he who enjoys what he is doing, is apt to do it well. Whatever may have been Doctor Raymond's former aspirations, in looking back over his long and richly varied career, he may feel a satisfaction in the knowledge that the mining industry and profession value enormously high the results in their behalf that he has achieved.

The Copper Market

It must be admitted that the European copper statistics for the second half of April are disappointing, there having been no reduction in the visible supply. This is somewhat surprising in view of the lightness of the exportation from this side in March and April, and is explainable only by a failure of the demand from consumers on the other side to maintain itself at the rate expected. Statistics due next week will undoubtedly show an increase in the accumulation on this side. Consequently the situation will appear statistically less favorable at the end of April than it was a month previous.

While we are optimistic in a broad view, especially with respect to increasing consumption, it must be recognized that for the moment the prospect for the copper market is inauspicious. Although the world's visible supply is proportionately less than some previous accumulations the existence of a large stock has created a pessimistic popular impression which apparently cannot be dispelled. Although manufacturers may recognize that copper ought to fetch upward of 13c., they evidently are not interested in laying in supplies under present conditions. The outcome will probably be such concession in price by the leading producers as will interest speculators in taking over large blocks of the accumulation with a view to carrying the metal for a long pull. After that the market may be in a position for an upward turn. At what price speculators will be interested remains to be seen.

Connellsville Coke Production

The weekly figures of coke production issued by the Connellsville *Courier* are usually so nearly correct and are so generally accepted that when they apparently showed a drop of over 100,000 tons in the production, we sought to assign reasons for such a drastic reduction. It now appears that in some unexplained way an error was made in the figures, and that the falling off in the week ended April 16 was really only about 9000 tons. We may add that for the week ended April 23, the figures for which have since been received, there was a further drop of about 13,000 tons.

The production for last week was, therefore, the smallest reported this year, and was 38,500 tons below the weekly average for the first quarter. This, though very much less than the supposed reduction, is in itself a considerable decrease; and some of the reasons given in our comment will apply to the lesser actual decline in the production.

Charles F. Chandler

High testimonials were paid to Prof. Charles F. Chandler at the dinner given in his honor by his friends and the chemical fraternity on April 30, in New York, on the occasion of his retirement from active work at Columbia University. Those tributes were well deserved. Beginning over half a century ago when chemistry was not far past the first stages of its present development, he has not only kept pace with, but helped to lead that development. An indefatigable worker, he also rendered excellent service as a professor, as a member and president of the Board of Health of New York and in other public capacities. With all this, he was able to continue the studies and investigations which kept him in a high rank among the chemists of his time.

Among mining men he will be best regarded and esteemed for the work which he, with Professor Egleston, did in organizing the Columbia School of Mines, and in developing it from its small beginning to its present high standing. No small part of its success has been due to his work, and to the faculty which he possessed of holding the interest of his students and gaining their respect and personal attachment.

Professor Chandler retires from his official positions, but he is not a man to lose interest in his profession, and he will doubtless remain a student and a worker during the years left to him, which we all hope may be many.

Coal Mining Wages and Prices

The inevitable result of the Western wage settlements is an increase in the cost of mining. In several important districts an increase of 5c. per ton in the mining rate has already been agreed on, and it seems certain that others must follow. Besides this, increases are being made in day wages, deadwork and other items, which will bring the advance in the cost of coal at the mines well up to 10c. per ton. This is an increase which operators in many districts are hardly able to carry under existing conditions. Unless there is a corresponding general advance in selling prices, many mines will have a hard time to make ends meet, to say nothing of profits. That such an advance can be secured under the competition of the nonunion States is by no means certain.

The great weakness in spelter during the last month has been due to the overbought condition of the principal manufacturers and the continued large production by the smelters. Operations of the latter have been stimulated by the liberal supplies of ore. This industry is fortunately one in which demand and supply can be quickly adjusted, operations in the zinc mines, as a rule being conducted upon a relatively small scale, permitting quick closure, while similarly among the smelteries it is a comparatively easy matter to put furnaces upon "dead fire," or let them go cold. Mines in the Joplin district are already being closed, and doubtless also the smelters will shortly begin to relax their pace, unless there be a speedy revival in demand.

The bill creating a bureau of mines has passed the Senate, and doubtless will promptly become a law by the President's signature. Although we have not been of the opinion that this bureau is necessary, we bow to it as an organization about to be established and are wishful that it may have a successful and useful career. If Doctor Holmes becomes its head, we are sure that its affairs will be directed with sincerity of purpose, a high order of intelligence and a capacity for management that has been well proved. The Geological Survey is to be congratulated upon the removal of interests that are foreign to its proper field.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

Fifth Annual Report of Utah Copper Company

The 1909 report of Utah Copper Company gives the means of calculating some of the costs and production percentages, which, in view of the great interest in porphyry coppers, may prove instructive.

Probable Grade of Ore

The total ore treated was 2,674,271 tons. The total production of copper contained in concentrates was 54,472,845 lb. This equals 20.3693 lb. per ton of ore, or 1.0185 per cent. If the ore treated was of the same grade as the stated average grade of the reserves, or 1¼ per cent. copper, the mill saving in concentrates was but 58.2 per cent. No authoritative statement of the actual grade of ore milled has been published, but as the saving in concentrates may be taken to be between 65 and 70 per cent., the ore probably has averaged between 1.45 and 1.55 per cent. copper. The production of copper at 8.787c. per lb. from material of such extremely low grade would have been considered impossible upon this character of ore if it had not actually been done, and reflects great credit upon the engineers in charge.

The concentrates yielded 20,862 oz. gold, or 0.00780 oz. per ton of ore treated, or 0.806c. per lb. of net copper production. They also yielded 198,943 oz. silver, smelter returns, or 0.0744 oz. per ton of ore treated, with a value of $102,511, or 0.198c. per lb. of net copper production. As the smelter return for the silver was 95 per cent. of the actual silver in the concentrates, as per assay, the total silver in the concentrates was 209,414 oz., or 0.0783 oz. per ton of ore treated. Excluding the smelter returns of the gold and silver (1.004c.), the cost of the copper (net production) was 9.791c. per pound.

The net copper production of 51,749,233 pounds of copper is equivalent to 19.3508 lb. of copper per ton of ore treated, or 0.9675 per cent. This shows smelter deductions and allowances of 2,723,612 lb. of copper from the contents of the concentrates for smelting losses, or precisely 5 per cent. As the copper content of the concentrates is stated to be 26 per cent., the total copper content of the concentrates divided by 0.26 will give the weight of the concentrates. This is 209,510,942 lb., or 104,755 tons dry weight. Freight paid on ore is stated to be $762,081, or 28.497c. per ton of ore treated. But as the freight rate on ore is 27c., the difference, 1.497c. per ton, amounting to $40,034, may be assumed to be the freight on concentrates from the mills to the smeltery, or 38.2c. per ton of dry concentrates. As the concentrates contain about 14 per cent. moisture, the average freight on them from the two mills may be taken as about 34c. per ton.

Mining and milling at 94.43c. per ton of ore treated equals $2,525,314, and may be assumed to include the items in the income account; "operation," "mine development," "prepaid expense, ore stripping," and "New Jersey annual license tax," which sum up $3 less. There is not sufficient information in these reports to be able to calculate what the mining costs and milling costs separately were. However, the quarterly reports that have been published from time to time give a division of the mining and milling costs which, while showing considerably lower costs than shown in the annual report, may be used by increasing the amounts proportionally to give an approximate figure which cannot be far wrong. Two of these reports, which I have at hand, give an average of 66 per cent. milling and 34 per cent. mining, which applied to the figure 94.43c., gives milling 62.40c. and mining 32.03c. per ton treated.

"Treatment and Refining" may be assumed to include smelting charges, converting, and freight, refining and selling charges on the blister copper returned by the smeltery. These charges amount to $1,779,866, or 3.44c. per lb. of net copper production. According to the Utah Consolidated report for 1908,[1] its cost for "freight, refining and selling" for that year was 1.328c. per lb. of copper, and from the dividends paid by the Raritan refinery it is apparent that there was an ample profit in the operation at that price. If we assume that the Utah Copper Company had as good a rate, then the smelting and converting charges amounted to 2.112c. per lb. of net copper produced, or $10.433 per ton of dry concentrates.

In smelting the concentrates some fluxes will have to be added to produce a fusible slag and it may be calculated that the slag produced will amount to about 84 per cent. of the weight of the concentrates, equal to 88,000 tons. The copper in the slag probably amounted to 0.5 per cent. or 880,000 lb., which was lost by the smeltery. There was an additional copper loss in the smeltery from stack losses and dust which may be approximated as 800 lb. of copper per day, or 292,000 lb. for the year, making with the slag loss a total of 1,172,000 lb. of copper lost in the smeltery. The difference between this amount and the amount deducted for smelting losses from the content of the concentrates is 1,551,612 lb., which, after deducting converting, freight and refining costs, was worth 11½c. per lb., or $178,435, at the smeltery.

If we add to this the difference between the amount paid for the gold at $20 per oz., and the price ordinarily paid for gold in blister copper, $20.50 per oz., making $10,431, we have $188,866 to be added to smelter charges, or $1.803 per ton of concentrates, making a total smelting charge of $12.236 per ton. No allowance should be made for any gain to the smelter in the silver contents, as the silver losses on such low-grade material will fully equal the deduction.

Cost of Smelting

The cost of smelting these concentrates at Garfield, including calcining, general expenses, taxes, insurance, salaries, etc., may be taken to be $2.50 per ton. To this must be added the cost of 9.3 per cent. iron at 7c. per unit, 2.5 per cent. lime at 6c. per unit, or 80c. per ton for fluxing, and the cost of converting 494 lb. of copper at $7 per ton of copper, or $1.73 per ton of concentrates, being a total of $5.03 per ton. This leaves a net profit per ton to the smeltery of $7.206 per ton of concentrates, equal to $754,865, or 1.459c. per lb. of net copper produced.

No allowance is made for interest as it is apparent that the mine is carrying the metals during treatment. Amortization of the smelting plant is not considered, but it is evident that sufficient profits are being made to provide a surplus that would amortize the plant in a short time.

Redick R. Moore.

New York, May 2, 1910.

[1] "The Mineral Industry." Vol. 17, p. 213.

Determination of Sulphur in Cyanide Solutions

A correspondent inquires if some reader of the Journal will describe an accurate method of determining sulphur existing as sulphide in cyanide solutions or in commercial cyanide.

April Dividends

The accompanying table shows the amount per share and total amount of the dividends paid during April, 1910, by a number of mining and industrial companies in the United States, Canada, and Mexico.

U. S. Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
Am. Sm. & Ref., pf.	U. S.	$1.75	$875,050
Am. Zn. Lead.....	Kan.	0.50	40,060
Anaconda, c.....	Mont.	0.50	600,000
Arizona Copper.....	Ariz.	0.047	59,485
Boston & Mont., c..	Mont.	3.00	450,000
Boston-Sunshine, g..	Utah	.....	3,004
Bunker Hill & Sul..	Ida.	0.25	75,000
Caledonia, s.l.....	Ida.	0.02	20,000
Champion Copper...	Mich.	2.00	500,000
Copper Range, c....	Mich.	1.00	384,185
Daly-West, s.l.....	Utah	0.30	54,000
Florence-Goldfield, g	Nev.	0.10	105,000
Gladstone, g.....	Cal.	.....	3,000
Goldfield Con., g....	Nev.	0.50	1,779,424
Guggenheim Expl...	U. S.	2.50	519,832
Hecla, s.l.....	Ida.	0.01	10,000
Homestake, g.....	S.Dak.	0.50	109,200
Iron Silver, s.l.....	Colo.	0.10	50,000
Kennedy, g.....	Cal.	.....	30,000
New Idria, g.....	Cal.	0.30	30,000
Portland, g.....	Colo.	0.02	60,000
Sioux Con., s.l.g....	Utah	0.04	29,855
Snowstorm, s.l.....	Ida.	0.01½	22,500
Stratton's Independence, g.....	Colo.	0.50	500,000
Tonopah of Nev ,g.s.	Nev.	0.35	350,000
U. S. Min. & Sm., pf.	Utah	0.87½	307,033
U.S. Min. & Sm.,.com.	Utah	0.50	243,022

Foreign Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
Cia. Met. de Torreon	Mex.	.....	$300,000
Crown Reserve, s...	Ont.	$0.15	265,000
Hedley Gold, g.....	B. C.	0.30	36,000
Hudson Bay, s.....	Ont.	3.00	23,283
La Rose, s.....	Ont.	0.10	149,840
N.Y. & Hond.Ros.,g.	C. A.	0.10	15,000
Nipissing, s.....	Ont.	0.36½	435,000
Pinguico, s.....	Mex.	3.00	60,000
Right of Way, s....	Ont.	0.02	33,710
Temiskam'g & H.B.,s	Ont.	3.00	23,283

U. S. Industrials.	Situation.	Amt. per Share.	Amt. Paid.
Amer. Ag. Chem....	U. S.	$3.00	$544,590
Consolidation Coal..	Md.	1.50	285,370
Genl. Chem., pfd....	U. S.	1.50	150,000
National Lead.....	U. S.	1.25	258,192
Pittsburg Coal.....	Penn.	1.25	371,263
Republic I. & S.....	Ill.	1.75	359,296

Chronology of Mining for April, 1910

April 1—All of the organized coal workers of the Easern and Central coalfields quit work.—Wages of iron miners in Lake Superior region increased by U. S. Steel Corporation from 6 to 8 per cent.

April 4—Mount Hope washery near St. Clair, Penn., burned.

April 5—Accident to engine at the Neversweat mine, Butte, killed engineer McNabb and caused extended shutdown.

April 9—Fire at Consolidated mill, Goldfield, Nev., destroyed refinery, conveyer and trestle to mill and damaged 20 stamps, causing cessation of all milling operations for seven days.

April 10—Receivers appointed for Mitchell Mining Company, owning La Dicha mine, Guerrero, Mexico.

April 13—Shipping from open pits began on Mesabi range, Minnesota.—U. S. Steel Corporation advances wages of its 200,000 employees.

April 14—Ten men killed in Santa Gertrudis mine, Pachuca, Mex., by failure of air compressor to supply ventilation.

April 16—Consolidated Arizona company resumed smelting at Humboldt, Arizona.

April 20—British Columbia Copper Company secures practical control of the New Dominion Copper Company—Merger of Dominion Iron and Steel and Dominion Coal companies approved at joint directors' meeting.

April 21—Forty-one men killed by explosion in coal mine at Mulga, Alabama.

April 22—Mine explosion at Amsterdam, O., kills 18 men.

April 25—Compromise effected between Bunker Hill & Sullivan and Federal companies, the latter relinquishing the Last Chance mine in Idaho in exchange for 27,000 Bunker Hill shares.

April 24—Accident, caused by a cave, in the Camelia mine, Pachuca, Mex., kills seven miners.

April 30—Coal strike practically settled in Indiana, Ohio and Pittsburg.

The Clancy Cyanide Patents

Owing to the extensive discussion relative to the nature of the Clancy process and the reticence of the controlling company in furnishing the details of same prior to the issuing of patents, the texts of the patents issued on April 19, 1910, to John Collins Clancy, (U. S. Pats. 955,318 and 955,319) contain some specific statements of interest.

Treating Refractory Ores without Preliminary Roasting

The Clancy process is designed particularly to treat, without preliminary roasting, refractory ores, especially those containing reducing agents or tellurium. Mr. Clancy states in his first patent that he has discovered that ores containing the precious metal may be advantageously treated by the use of a cyanide solution containing a soluble iodide and a suitable substance capable of yielding nascent oxygen in said solution. He suggests using, as an example, a potassium-cyanide solution with a soluble persulphate such as sodium or ammonium persulphate, and iodine or a soluble iodide such as potassium iodide. The desired result is said to be prevented if the solution is substantially acid, although it will take place if the solution be neutral or alkaline or only slightly acid. The following proportions of these chemicals are suggested as answering the purposes of the process. A solution containing one pound of potassium cyanide, one-half pound of potassium iodide, three pounds of sodium persulphate, and one-half pound of lime or soda dissolved in one ton of water and used in the proportion of two parts of the above solution to one part of ore. The solution can be used repeatedly by keeping up the requisite strength in cyanide and sodium persulphate, but no further addition of potassium iodide is necessary except to compensate for mechanical losses as the persulphate regenerates the iodide.

Mr. Clancy also suggests another way of carrying out his invention by substituting ozone for the persulphate, recommending a solution of one pound of potassium cyanide, one-half pound of potassium iodide, and one-half pound of lime or soda dissolved in one ton of water. The amount of ozone to be passed into the solution, with or without the admixture of air, is to be determined by titration or otherwise. He found that 200 grams of ozone per ton of solution gave good results, although with some ores as little as 15 grams was successfully used. When the ozone is used, no further addition of potassium iodide is necessary except to compensate for mechanical losses, the ozone regenerating the iodide. Peroxide of nitrogen may also be used as an oxidizing agent. It is stated that instead of applying said oxidizing agents to the solution in the presence of the ore, they might be applied, although less advantageously, to the solution after it has been separated from the ore. It is claimed that it is not necessary to roast the ore, since the reducing agents such as sulphides of iron, etc., do not act upon the solution to decompose it, and the tellurium is dissolved simultaneously with the precious metal.

The Specific Claims of the Patents

Mr. Clancy's specific claims under Pat. 955,318, are:

1. The process of treating pulverized ore containing precious metals, which consists in subjecting said ore to the action of a cyanide solution, a soluble iodide and a substance capable of yielding nascent oxygen in the presence of said solution.

2. The process of treating pulverized ore containing precious metals, which consists in subjecting said ore to the action of a cyanide solution, a soluble iodide and ozone.

The specific claims under Pat. 955,319 are:

1. The process of treating pulverized ore containing precious metals, which consists in subjecting the ore to the action of a cyanide solution, a soluble iodide and a soluble persulphate.

2. The process of treating pulverized ore containing precious metals, which consists in subjecting the ore to the action of a cyanide solution, a soluble iodide, and persulphate of sodium.

3. The method of treating ores containing tellurides of gold, which consists in applying thereto a cyanide solution, a soluble iodide and a soluble persulphate.

Two Sides of the Consolidation Question

SPECIAL CORRESPONDENCE

The Crown Mines, Ltd., and Jupiter-Simmer Deep present two interesting contrasts among the numerous amalgamation schemes that have lately been brought about on the Witwatersrand. The Crown Mines comprises a number of properties that had already been laid out as separate mines and equipped with separate reduction works prior to amalgamation, whereas the Jupiter-Simmer Deep amalgamations were able to start work with a single central reduction plant. Much doubt has been cast on the wisdom of the policy of amalgamating under one management old producing mines, separately laid out and separately equipped, and the career of the Crown Mines, Ltd., is therefore being watched with keen interest.

Of the wisdom of amalgamating adjoining areas not possessing separate power and reduction plants, there can be no doubt, and the career of the Jupiter-Simmer Deep has already demonstrated this practically.

The results obtained so far by the Crown Mines are fully dealt with in the annual report just issued. During the first six months of this period the mines were working as separate concerns, but during the second six months they were operating as an amalgamated concern. During the first half of the year 829,400 tons were milled at a profit of £723,000. The recovery grade was 32s. 6.7d. ($7.92), the costs 15s. 1.5d. ($3.68), and the profit 17s. 5.2d. ($4.23) per ton milled. During the second half of the year 740,900 tons were milled at a profit of £627,135. The recovery grade was 33s. 8.9d. ($8.20), the costs 16s. 9.8d. ($4.08), and the profit 16s. 11.1d. ($4.12) per ton milled.

The separate producing companies which comprise the Crown Mines were doing better a year ago than they are today, although the ore is not poorer now than it was then; the scarcity of native labor during the last six months, however, has been a great handicap, and the consulting engineer, G. E. Webber, maintains that the improved results anticipated will yet be realized. The ore reserves are estimated at 3,916,500 tons of a value of 7.7 dwt. per ton.

The advantages of amalgamating a large area when it is able to start fresh with a single central reduction plant are well demonstrated by the year's results of the Jupiter-Simmer Deep. In spite of its lower grade, the relatively large proportion of unpayable ore and greater depth, its working costs are 15s. ($3.65) per ton milled as compared with the 17s. ($4.12) of the Crown Mines—the stoping conditions, it should be mentioned, are approximately the same in these two areas. About 70,000 tons per month are being crushed by the Jupiter-Simmer Deep. The profit for the year was £234,700. The ore reserves are estimated at 2,508,000 tons of an average value of 5.5 dwt. per ton.

Alexander Agassiz

Alexander Agassiz, whose likeness is reproduced herewith, and a sketch of whose life and services was published in the JOURNAL of April 16, was known chiefly in his later years as a scientist and investigator. Most of his time in those years, indeed, was spent in the study of natural history and of scientific problems. Comparatively few remember that over 40 years ago he began the work which brought out and proved his ability as a

ALEXANDER AGASSIZ

mining engineer. He went out to the Lake Superior region, and it was under his direction and on his plans that the Calumet and the Hecla mines, then struggling through their first stages, were united and developed into the great Calumet & Hecla property, the most successful and one of the largest copper mines in the world. He was for a number of years in immediate charge of the mines; and, as president of the company up to the time of his death, 40 years, he was in close touch with its affairs and in control of its general management. Its great success was due in large part to his work as an engineer, and his clear-headed business ability also contributed materially.

Professor Agassiz will probably be remembered chiefly from his scientific labors, which were best known to the world; but the admirable work he did as a mining engineer should not be forgotten.

Anaconda and Amalgamated

The application to list $75,000,000 additional Anaconda stock calls attention to the singular positions now occupied by Amalgamated and Anaconda, says the *Evening Post*. Hitherto the Amalgamated Copper Company was the holding concern for a number of Butte properties. It held among other assets, a majority of Anaconda stock; the minority of Anaconda was left to be traded in on the Stock Exchange. Now the Anaconda increases its stock in order to take over by exchange of shares the assets formerly held by the Amalgamated Copper Company, and it is proposed to list the additional stock. If it is listed, Amalgamated Copper and Anaconda will be traded in side by side on the Stock Exchange, one owning the other, and the other owning all that was formerly owned by the Amalgamated. So much Anaconda will equal so much Amalgamated; or so much Amalgamated will equal so much Anaconda, and the buyer may choose as to the color and beauty of his certificate. In order to obtain admittance to the listed department of the Stock Exchange, before the unlisted department was finally abolished, the Amalgamated Copper Company agreed to submit yearly an income account and balance sheet for each of its constituent companies. Now the Anaconda will be its only constituent; all the others will be constituents of the Anaconda. The matter of consanguinity becomes, therefore, more complicated.

Coal Mine Explosion in Ohio

Of the 23 men who were entrapped by an explosion of gas in the Amsterdam mine of the Youghiogheny & Ohio Coal Company, at Amsterdam, Ohio. only seven men were rescued alive. The bodies of the remaining 16 miners have been recovered. The cause of the explosion has not yet been definitely determined; however, it is presumed that a pocket of gas was ignited by a miner's lamp. Engineer J. W. Paul, of the United States Geological Survey station at Pittsburg, arrived at the mine shortly after the accident occurred. Mr. Paul brought with him four oxygen helmets to aid in the rescue of the entombed miners.

Antimony in the United States

According to statistics collected for THE MINERAL INDUSTRY, the production of antimony ore in the United States in 1909 was 95 tons, valued at $4700, as compared with 360 tons valued at $19,800 in 1908. Under the Payne tariff, the existing duty of ¾c. per lb. on antimony was doubled, with the idea of stimulating the production of domestic ore.

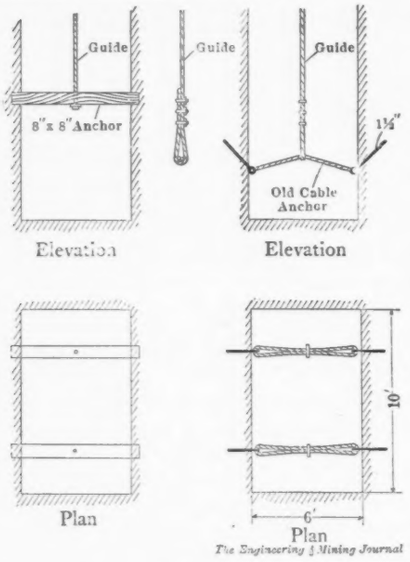
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Anchoring Wire Rope Guides in Shafts

BY T. SKEWES SAUNDERS*

The method most commonly employed for anchoring wire rope guides in shafts is that of beams placed across the shaft, firmly set in suitable hitches cut in the sides of the shaft. A heavy iron washer is then slipped over the end of the rope guide after which the end is doubled back on itself and held in position by means of a heavy clip. Tension is then applied to the upper end at the head frame, the clip and washer preventing the guide from being pulled, or working its way through the timber anchor.



METHOD OF ANCHORING ROPE GUIDES IN SHAFTS

Another method of anchoring wire rope guides which I have extensively used during shaft-sinking operations, is that of using old cables as anchors. In this method four holes, two on each side of the shaft, are drilled into the walls, inclined upward at an angle of about 45 deg. These holes are drilled to a depth of about two feet, and have a diameter of 1½ in. Eye bolts are driven in as shown in the accompanying sketch. The eye bolts are made of 1½-in. iron, two feet long outside of the eye, and have their points split for about four inches of their length to allow of the insertion of an iron wedge of one-quarter inch thickness. When the eye bolt together with the wedge is well driven in no amount of strain or vibration upon the guide or anchor will loosen it. A piece of old cable is inserted in the eye of each bolt connecting two opposite anchors. The ends of this old cable are pulled together and held in position by means of cable grips. The wire rope guide is then passed under the old cable, bent back upon itself for about two feet, and secured by cable grips also. The guide is then given the necessary tension at its free end.

The advantage of the cable and eye-bolt anchor over the usual timber anchor is that they are less liable to injury by blasting operations, and the ease with which the anchors can be placed as compared with the cutting of the necessary hitches for the timber anchor. I have occasionally seen the eye bolts barbed in order to get a better hold on the rock but when the iron wedge is used and the holes inclined upward at an angle of 45 deg., barbing is unnecessary. The old cable anchors may be used any number of times as one lowers the guides in accordance with the progress in shaft-sinking, but the eye bolts cannot be thus utilized as they are too firmly fixed. Should the eye of the bolt project into the shaft and disturb subsequent timbering or other operations it may be cut off by a hack saw.

*Mine superintendent, Teziutlan Copper Company, Aire Libre, Puebla, Mexico.

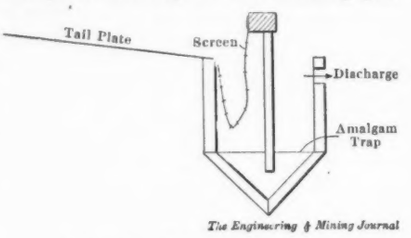
Stoping at Goldfield Consolidated

On the 900-ft. level of the Clermont mine of the Goldfield Consolidated the Clermont stope is opened for about 150 ft. on the strike of the vein and shows a width averaging 40 ft. On account of its high grade, all of the ore must be recovered but it is desirable to use the minimum amount of timber. Under the present stope practice, introduced by J. Donnelly, mine superintendent, 8x8-in. material is used for the square sets and no trouble has been experienced from the timbers swinging. Square sets and waste filling are used.

The orebody is opened in sections eight sets long, and at each eighth set a manway is maintained. Every fourth set is used as a chute. The stope is filled with waste obtained from hanging-wall crosscuts, filling being kept up to the second floor below the back of the stope. Sill sets are 8 ft. in the clear and are framed of 10x10-in. material, but the stope is carried up with 8x8-in. timbers, the sets being 7 ft. high. The end set of each section of stope is left open so that there will be no danger of filling crowding in and wrecking the manways. Where necessary, cribbing is resorted to for confining the filling. By working the orebody in such short sections the danger from timbers swinging is eliminated and it is possible to work successive sections instead of alternate ones as must often be done.

Screen in Amalgam Trap

In the Florence mill, Goldfield, Nev., amalgam traps of the type shown in the accompanying drawing are used below the battery amalgamation plates. A piece of wire cloth is secured to the end of the tail plate and top of the dividing partition of the trap and serves to catch lime scale, bits of wood, etc., that have passed through the battery screens. The removal of this lime scale is found to assist the later table treatment.



AMALGAM TRAP WITH SCREEN

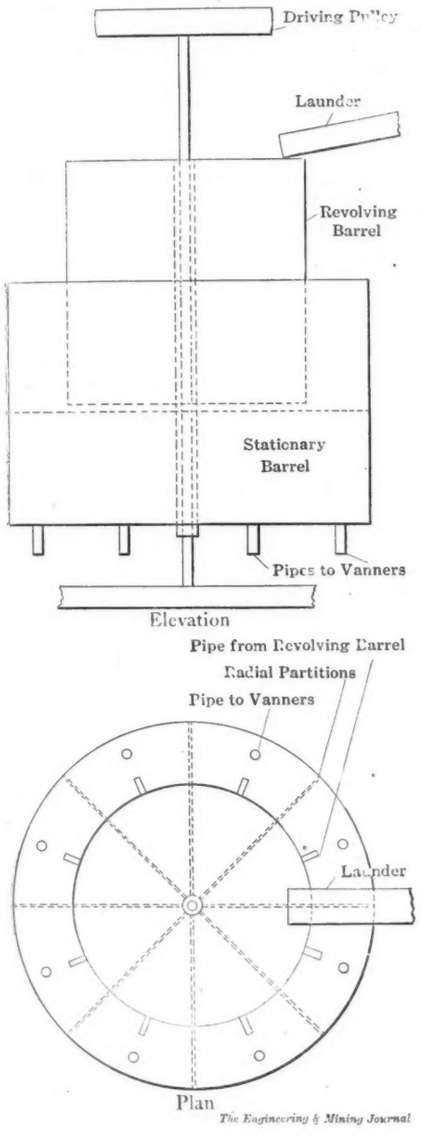
Renewing Filter Leaves

A number of the mills using vacuum fifters of the Butters type find it convenient and cheap to rebuild the worn leaves. The usual practice is to discard the expensive cocoa matting and substitute grooved wooden strips. These strips may vary in lateral dimension but extend the full hight of the leaf. Strips, 2 in. wide with ¼x¼-in. grooves on both sides, are satisfactory. The canvas filter cover is stitched between the strips so that each one slips in a separate pocket. Filter leaves constructed in this manner are thoroughly satisfactory, wear well and can be built at a reasonable cost at the works.

During the last year three additional steam shovels have been provided by the Utah Copper Company, making eleven in all; four locomotives, making a total of 21 now in service; and twenty dump cars, making a total of 145. There were also added 6.4 miles of standard-gage railway track for stripping and mining purposes, making a total of about 16 miles.

Pulp Distributer

The accompanying sketch shows a pulp distributer in use at several mills. The machine shown is driven by a belt from a vanner line shaft, but by turning the spouts horizontally it may be made automatic, although the feed will not be positive and the machine will stop when the pulp discharge is low. The machine consists of a barrel, the bottom of which



PULP DISTRIBUTER USED IN THE JOPLIN DISTRICT

is divided into as many radial segments as there are vanners or tables to feed. Inside this barrel another barrel revolves, carrying in the side near the bottom as many radial pipes as there are divisions in the outer stationary barrel. This is not arbitrary, since as many pipes may be used as necessary. The pulp is fed into the inner barrel, which revolves at about 50 r.p.m. and distributes the pulp evenly into the compartments of the outer stationary barrel. This arrangement will satisfactorily feed 10 tables.

Inaccuracies of Churn Drill Sampling

BY HORACE A. FULD*

In the development of the low-grade copper deposits, it has become the custom to prospect for ore by means of churn drills. The results are averaged and the worth of the property thus approximately determined. The accuracy of the method may be questioned for the following reasons:

In looking over the assay returns from any hole, one will notice the gradual change in mineral content; no sudden jump as in mine sampling is apt to show. This is probably due to the jarring loose of material from above by the rope and string of tools. In bailing out each five feet of hole, the bailer pumps out the bottom first, and theoretically the ore will concentrate at the bottom. The bailer will pick up not more than, say, 90 per cent. of the churned material, and the sample would thus be increased over the actual mineral content of the five feet of ground.

For a distance of 100 ft., drilling through copper sulphides, I took samples of the first and last bailing of each five feet. These showed a difference of but 0.01 per cent., and it was concluded that this departure from the theoretical concentration was due to float mineral and slimes. The mineral was assumed to have been ground up in the hole and then, through the medium of the circulating ground water or that from local fissures, was dissolved or floated away. This supposition is borne out by the fact that where raises have been cut around drill holes, the ore from the raises averages several tenths of a per cent. higher than the results obtained from the drill holes. Were this loss by float mineral negligible, the fact that not all the churned material is bailed up would give a false value for that particular sample although the average for, say, 50 ft. would be correct.

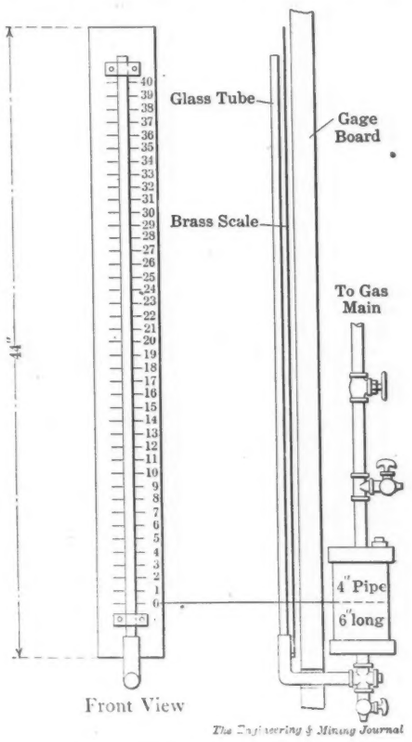
In the foregoing discussion I have concerned myself with a dry, non-caving hole. If the hole be wet or caving, the above inaccuracies still hold good and many new ones are introduced. A wet hole would tend to "slough off" material from above; in the bottom, more so than when the sludge is thicker; it would carry off a greater percentage of float mineral; and, finally, it would dissolve out the ore minerals in preference to the gangue, especially if the water were acid.

By careful panning, much can be learned concerning conditions in the hole. Each district has peculiarities of its own, and only by constant vigilance can accurate results be hoped for. In places where the zone of secondary enrichment is being sought, or where a more or less blank capping overlies the ore, the holes should be cased when the desired ore is encountered.

*Miami Copper Company, Miami, Ariz.

An Improved Water Pressure Gage*

In rearranging the indicating and recording instruments in a blast-furnace gas-cleaning plant, it was necessary to overcome the frequent blowing out of the liquid in a U-tube water-pressure gage. This gage is used to show the pressure of the gas as it enters the scrubbers, and on account of sudden changes in pressure when the furnace slips, frequently goes



IMPROVED WATER GAGE

for a few seconds as high as 40 in. of water.

With the old U-tube gage the quick rise in pressure would cause the water to move so fast that it would blow out and then the gas would have to be shut off the gage and the latter carefully refilled to the zero mark.

A gage was made consisting of a single ⅛-in. glass tube with a rubber connection through the gage board to a piece of pipe, 4 in. in diameter and 6 in. long, on the back of the gage board. The pet cocks shown are for adjusting the gage to zero.

To prepare the gage for use, the pet cocks and valve are closed and the 4-in. pipe is filled with water; then the lower pet cock is opened until enough water runs out to allow the water in the glass

*Power, April 5, 1910.

tube to stand at zero. The filling plug is then replaced and the valve in the pipe leading to the gas main is opened. To test the gage for zero, close the valve and open the upper pet cock.

On account of the lowering of the surface of the water in the larger pipe, the scale of 40 graduations should be only

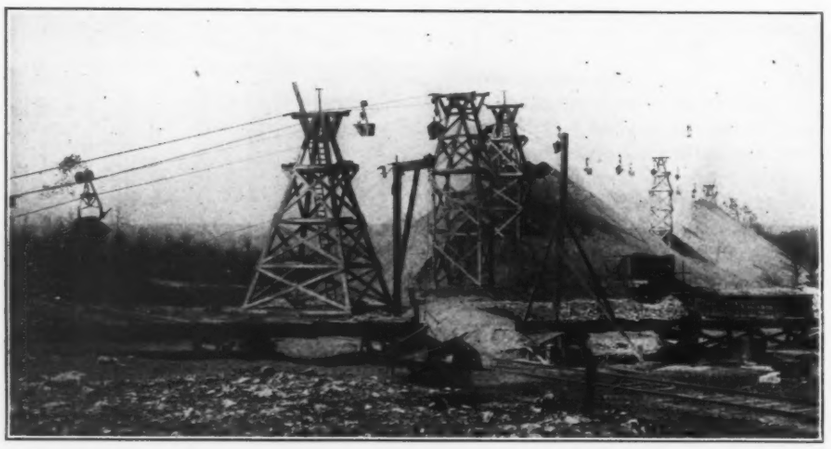
$$\frac{40 \times (4^2 - \frac{1}{8}^2)}{4^2} = 39.96$$

inches long, but for ordinary work this error could be neglected.

The large body of water in the 4-in. pipe "chokes" the tendency toward a sudden rush of water through the tube and with the compression space above the water makes it almost impossible to blow out any water under working conditions.

Tailings Tramway of the Federal Lead Company

The handling of tailings from a mill treating 3000 to 4000 tons of ore per day is a problem that is of utmost interest to mill operators. The plant in use by the Federal Lead Company, Flat River, Mo., consists of an aërial tram 2500 ft. long. The towers are 100 ft. high and a 1⅝-in. lock-coil cable is used for the loaded buckets and a similar cable 1⅛ in. in diameter for the empty buckets. The traction cable is ⅞ in. in diameter and has six strands of seven wires each. The speed of the traction cable is 260 ft. per minute, and the buckets are spaced 110 ft. apart. There are 45 buckets, each having a capacity of 22 cu.ft. or about 2300 pounds.



AERIAL TRAM AND TAILINGS DUMP, FEDERAL LEAD COMPANY, FLAT RIVER, MISSOURI

This system has been in use 2½ years and handles approximately 3000 tons per day. Nearly all of the available space for dumping beneath the cable is now taken up, and in order to provide more space it will be necessary to build the towers still higher. The accompanying illustration shows the plant in operation. Four men are required to operate the system.

Notes on Drilling Placer Ground

In boring dredging ground not deeper than 40 ft., it is possible to do the work with hand tools. Many "sample" bores have been put down without casing, or if casing was used, its function was merely to prevent the sides of the hole falling from above the tool. A derrick, described by Ernest K. Hall, in *Aust. Min. Stand.*, composed of three light, round sticks and giving 17 to 18 ft. head room is set up over the station, and a windlass set across two of the legs for raising and lowering the rods and tools. Suitable windlass rope is 5/16-in. flexible plow steel.

In raising the casing after a hole is finished, the dead weight of the pipes is a small matter compared with the friction to be overcome. It is handy to have always hanging from the derrick head a 1½-ton chain hoist. In pulling the casing, give it a turn or two just before pulling with the hoist. If this is insufficient, two sapling poles, like that used for turning, may be attached to the casing near the ground by close link chain, and opposite one another. These then add their pull as levers, using logs or anything else suitable and convenient for a fulcrum.

The core of ground is cut and removed by whatever tools are appropriate, to a depth of from 6 to 10 in. above the bottom of the casing. Since the accuracy of the whole operation depends greatly on the care used in not letting the tool penetrate below the casing, it is advisable to always leave as much as possible of the core near the bottom of the casing untouched, until this is lowered another stage.

In New South Wales last year 1677 tons of stream tin, valued at $714,630, were recovered by dredging. This was an increase of 115 tons over 1908, and was 69.5 per cent. of the total production of tin ore in the State.

The Electrolytic Determination of Copper at Tennessee Copper Company

BY T. W. CAVERS AND J. P. CHADWICK *

To determine rapidly and accurately the copper contents of the numerous ores and furnace products which are daily brought to the smeltery laboratory for analysis, the chemist has, in the majority of cases, adopted the electrolytic method. The various authorities on electrochemistry have discussed this subject mainly from the scientific standpoint, and although accuracy has been attained, the time factor has been treated as unimportant, so that the conditions under which their determinations have been made, are manifestly impossible to the technical chemist. It is hoped that the methods practised in the laboratory of the Tennessee Copper Company may prove both interesting and helpful.

LABORATORY EQUIPMENT

The laboratory equipment includes two electrolytic cabinets of different types: The rotating and the Guess-Haultain, which will be referred to as the stationary. The rotating type has been fully described[1] by A. M. Fairlie and A. J. Bone, so that a brief description will suffice. The cabinet is made up of eight units in series, and connected with a 220-volt circuit which will be replaced by a 550-volt circuit to insure steadier current. The cathodes are perforated platinum cylinders, 2 in. in diameter, with approximately 100 sq.cm. plating surface. Propeller-shaped platinum anodes revolving at about 500 r.p.m., agitate the electrolyte. By employing variable resistances, a current may be obtained ranging from 0.1 of an ampere, up.

The Guess-Haultain cabinet consists of 30 units in series, and takes the current from a 550-volt line. The main distinctive features of this cabinet are: (1) A cathode suspended between two stationary anodes, the cathode being made from corrugated sheets of sand-blasted platinum, and having a plating surface of approximately 65 sq.cm.; (2) a small container for the electrolyte with a consequent concentration of the copper solution. Other minor features make the manipulation simple. For a detailed description of this cabinet, reference may be made to the paper by G. A. Guess.[2] The range of current at present employed on the Guess-Haultain is from 0.1 to 1.5 amp. and is obtained by using unit and variable resistances.

The daily routine of the laboratory in-

*Chemists, Tennessee Copper Company, Copperhill, Tenn.

[1] *Electro-Chemical and Metallurgical Industry*, Jan. and Feb., 1908.

[2] *Trans.*, A. I. M. E., 1905.

cludes the determination of copper in the following: Tennessee Copper Company ores; custom ores; blast-furnace slags; mattes and blister copper. The slag and blister-copper assays are made on the rotating, and the others on the stationary cabinet.

Rotating Anode Cabinet

An average analysis of the slag is as follows: Cu, 0.21; SiO_2, 40.3; FeO, 41.1; Al_2O_3, 5.4; CaO, 7.8; MgO, 2.6; ZnO, 1.2; and S, 1.1 per cent. This slag is the product of pyritic smelting and does not yield to the ordinary treatment with nitric acid, so the following method has to be resorted to:

A 3-gram sample of the chilled material, ground to 100 mesh, is weighed into a 4-in. casserole and treated with 15 cc. concentrated HCl (concentrated acids only are used). After standing for a few minutes the mass is broken up and detached from the bottom of the casserole by means of a stirring rod, the casserole covered, placed on the hot plate and allowed to come to a boil. From a burette, without removing the cover, 10 cc. HNO_3 are added, followed almost immediately by 5 cc. H_2SO_4. The covers are removed and the solution evaporated until dense white fumes are evolved. (This procedure is followed in order that all chlorides may be expelled, and also that the definite amount of free nitric acid, necessary for electrolysis, may be obtained.) The casserole is removed from the hot plate and the soluble salts are taken up with 2 cc. HNO_3 and 30 cc. water and boiled a few minutes. After filtering and washing with hot water, the clear solution is diluted to about 175 cc. in a 250-cc. beaker and electrolyzed for nearly an hour with a current of from 0.8 to 1 ampere.

The blister copper averages 99.4 per cent. copper. The drillings, having been ground to pass a 12-mesh screen, are thoroughly rolled and spread out on a mixing cloth. A 5-gram sample is weighed and treated in a 400-cc. beaker with 10 cc. of water and 20 cc. of HNO_3, the latter 5 cc. at a time. When the copper is all in solution, 5 cc. of H_2SO_4 are cautiously added and the HNO_3 all expelled by evaporation and fuming as in the case of slags. The copper, now in the form of sulphate, is taken up with 7 cc. of HNO_3, 1 cc. of H_2SO_4 and 300 cc. of water. When all the salts are dissolved, the solution is electrolyzed at 4 amp. until it becomes colorless, when the current is cut down to 2 amp. and the precipitation completed. The first stage is finished in about one hour and the second in 30 minutes. Duplicates must check within one-tenth of 1 per cent.

Stationary Cabinet

The ores mined by the Tennessee Copper Company are of the following general analysis: Cu, 2 per cent.; S, 15 to 30; SiO_2, 30 to 12; Fe, 25 to 38; Al_2O_3, 3; CaO, 6.5; MgO, 2.5; and Zn, 1.8.

A 1-gram sample of 100-mesh ore is weighed out and treated in a tall 200-cc. beaker with 10 cc. of HNO_3 on a moderately hot plate until the brown fumes are expelled and sulphur separates, when 4 cc. of H_2SO_4 are carefully added, the covers and sides of beaker washed down and the free nitric acid expelled. After cooling, about 40 cc. of water, 2 cc. of HNO_3 and a few drops of H_2SO_4 are added and the soluble salts dissolved by gentle heating. The solution with a few drops of "dope" is then transferred to a 90-cc. beaker almost filled with water, and a current of 1.5 amp. passed through for three or four hours. If, for any reason, it is desirable to run the assays overnight, the copper can be completely precipitated by a current of 0.15 amp. in the presence of 1 cc. of free nitric acid.

The custom ores treated at the smeltery are highly silicious and range from 60 to 80 per cent. SiO_2, with from 3 to 12 per cent. Cu. Triplicate samples of 2 grams each are treated in the manner described above except that but 1 cc. of HNO_3 is added before electrolysis. Results must check to 0.03 of 1 per cent. Either the overnight or the short-time treatment may be given.

Matte Assays

The metallurgical practice is to smelt in two stages. In the first stage the copper in the ore is concentrated into a 10 per cent., matte, which is resmelted to obtain a product suitable for converting; consequently the mattes run between 10 and 40 per cent. copper. One gram of the 100-mesh sample is digested with nitric acid and evaporated to dryness with sulphuric acid. It is then taken up with 1 cc. of HNO_3 and 0.5 cc. of "dope," diluted to 85 cc. and the solution electrolyzed at 1.5 amp. for from 3 to 7 hours, according to the grade of the matte. Occasionally it is found convenient to start the assays in the evening, running over night at 0.15 amp. and finishing at 1.5 amp. the following morning.

General Remarks

Each month, composites are made from the daily samples of the different ores and furnace products mentioned above, with the exception of blister copper. For copper determination, triplicate samples of 2 grams each are treated in the manner indicated under the different headings, and subjected to a current of 0.15 amp. over night. The results must check within 0.03 of 1 per cent.

When all the copper has been precipitated, as shown by a negative test with strong H_2S water, the cathodes are removed from the cabinet and washed by dipping first in water, then in three separate jars of alcohol. After standing for a few seconds on a blotting paper, they are dried over a small spirit lamp, then weighed, and the results reported to 0.01 of 1 per cent.

The "dope" referred to in the foregoing is made from hard oil or vaseline, and nitric acid. To prepare: About 10 grams of vaseline and 100 cc. of HNO_3 are gently heated together, and when all action has ceased, the resulting compound is diluted to about 300 cc. On standing 24 hours, the straw-colored liquid, after filtering, is ready for use. The addition of "dope" to the electrolyte makes it possible to obtain firm and bright deposits when using a current of high density, and but small quantities of nitric acid; consequently, the time necessary for electrolysis is greatly reduced. Experiments are now being conducted in which small amounts of boric acid are used instead of "dope." The results are encouraging, but it is too soon to make a definite statement regarding any special advantages this treatment may at present seem to possess.

Comparison of the Cabinets

Ordinarily, the classes of work assigned to the different cabinets are as mentioned above, but no rigid lines have been drawn. When speed is unimportant, slags, for instance, are occasionally put on the stationary, but a "hurry up" determination on any sample whatever is always made on the rotating cabinet.

Equally accurate results on slag samples can be obtained from either cabinet, but the rotating one shows a decided advantage in point of speed. In the case of blister copper, determinations can be made more accurately, and much more rapidly, on the rotating cabinet. On ores and mattes, the stationary gives more accurate results and no difficulty is experienced in making the results check, while, upon the rotating, assays of the same sample not only vary, but average a trifle low.

It is also easier to obtain good bright deposits upon the stationary cabinet. In this respect, it might be mentioned that the heavy sulphide ores of this district have always given a great deal of trouble, because of their high-iron and low copper contents. The use of dope in assays on the ordinary stationary cabinet partially overcame this difficulty, but it was not until the Guess-Haultain cabinet was introduced into the laboratory a few months ago that good deposits became the rule.

In general, it may be stated that the rotating-anode cabinet will be found satisfactory where the number of daily copper determinations is small, and useful as an auxiliary in any laboratory. Where the number of determinations is large, we believe that a cabinet of the Guess-Haultain type, on which a great many coppers may be run at the one time, is almost indispensable.

The Dinner to Dr. R. W. Raymond

The dinner in honor of Dr. Rossiter Worthington Raymond at the Plaza hotel on the evening of April 30, was partly in celebration of his 70th birthday (April 27) and partly in appreciation of his 30 years of service as secretary of the American Institute of Mining Engineers and his contribution to the promotion of the profession of mining and metallurgical engineering. The dinner and the accompanying testimonial were given to Doctor Raymond by his friends, no organization figuring especially in the matter, although the mining and metallurgical engineers were naturally prominent.

SILVER SERVICE PRESENTED TO DOCTOR RAYMOND BY HIS FRIENDS

The dinner was attended by about 225, who were seated at small tables in the banquet hall of the hotel. At a long table at the end of the room were the toastmaster, Dr. James Douglas, guests and speakers. Doctor Raymond sat at Doctor Douglas' right and Mrs. Raymond beside Doctor Raymond. Among others at this table were Dr. Lyman Abbott, George Westinghouse, R. T. Bayliss, vice-president of the Institution of Mining and Metallurgy; Sorzano de Tejada, of Paris, representing the Société des Ingenieurs Civils de France; Capt. Robert W. Hunt, John Fritz, John A. Bensel, president of the American Society of Civil Engineers; Frank D. Adams, president of the Canadian Mining Institute; E. G. Spilsbury, W. L. Saunders and T. C. Martin.

In opening the exercises after the dinner, Doctor Douglas spoke in a delightful way of Doctor Raymond's career as sailor, soldier, engineer, editor, lawyer, poet, story writer and critic, and the circumstances under which his friends were brought together to do him honor. He then called upon Mr. Spilsbury, who read numerous letters of congratulation from friends of Doctor Raymond who were unable to be present. He also read a highly appreciative set of resolutions adopted by the Verein Deutsche Eisenhüttenleute, expressing the indebtedness of the technical industry of Germany to Doctor Raymond.

R. T. Bayliss, of London, was then introduced. "My appreciation of Doctor Raymond's useful life," said Mr. Bayliss, "can best be expressed by saying that I have crossed the Atlantic for the sole purpose of attending this dinner. When I heard of what was contemplated in honor of his 70th birthday, I felt that my trip to be present was the least I could do."

Mr. Bayliss then read a set of resolutions adopted by the Institution of Mining and Metallurgy, expressing the recognition of Doctor Raymond's work by the council of the Institution, and presented to Doctor Raymond the gold medal of the Institution, its highest honor, the previous recipients having been Sir Archibald Geikie and Dr. James Douglas.

M. de Tejada, being then called upon, began to tell in English of how much French engineers think of Doctor Ray-

mond's achievements. While he was speaking, a voice from the rear of the room yelled "louder," just as M. de Tejada was about to read a set of resolutions of congratulations by the Société des Ingenieurs Civils de France. His eyes twinkled as he turned and said, "It's all right; the rest of my remarks will be a reading of the tribute to Doctor Raymond in French." Whereupon the audience laughed and applauded.

Dr. Lyman Abbott, in a short and excellent address, said that he would waive aside all of the many accomplishments of the guest of honor, which were so well appreciated, and would talk of him "merely as the friend of his pastor." In doing so, Doctor Abbott made a very happy address, which was warmly applauded.

Doctor Adams, Mr. Westinghouse and Mr. Martin also spoke. Captain Hunt was particularly witty, and Mr. Saunders made a brilliant address to Mrs. Raymond, in conclusion of which he presented her with a magnificent bunch of roses. These addresses having been concluded, Doctor Douglas made some interesting remarks respecting the romance of the early days of mining west of the Rocky mountains, with which Doctor Raymond was so closely identified, and called attention to a representation of a Western mine standing upon the table before him. This showed in miniature a mountain with rocks, crags and pine trees, with mine buildings and representative scenes of surface work in mining. At the conclusion of his remarks, upon a signal, ribbons were pulled from each end of the table and the mountain parted in the middle, disclosing a magnificent silver service designed and made by Tiffany & Co., which was the testimonial presented to Doctor Raymond.

This service is shown in the accompanying engraving. The individual pieces are handsomely etched with scenes recalling phases of Doctor Raymond's life. Some of these are shown in the accompanying engravings, including the good ship "Great Western," of the Black Ball line, of which Doctor Raymond was third mate in 1858, and a view of Heidelberg, where he was a student in 1859. Another engraving shows him as a student at Freiberg, in 1860-61; another as captain in the United States army, 1861-64. Another shows the Grand cañon, with the following lines that Doctor Raymond wrote in July, 1889;

THE GRAND CANON

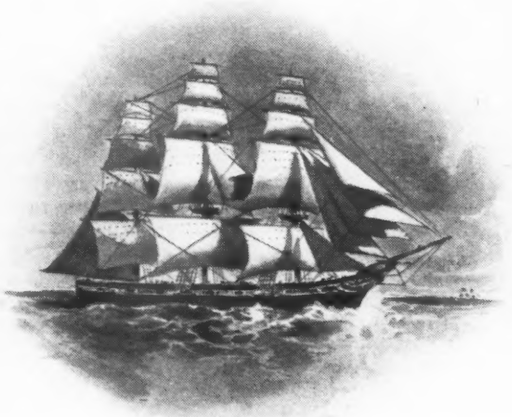
A thought of God, on earth expressed!
The silence of His perfect rest;
The patience of eternal power;
The ceaseless change from hour to hour;
Forms in alternate gloom and flame
That bide yet evermore the same,
And do but wear such fitful guise,
Reflected in our human eyes,
Which compass only in their range
The things that change, or seem to change;
The blended hues of heavenly birth
Beyond the tenderest tints of earth,
That fill and flood her spaces wide
With surges of celestial tide;
The beauty of that awful brink
Where meaner thoughts in rapture sink,
And souls see clear, though eyes grow dim,
While space and time are lost in Him!

Methinks I could not faint or flee
In any conflict yet to be,
Whatever pathway must be trod,
May I but keep this thought of God!

MRS. RAYMOND AND DOCTOR RAYMOND

GRAND CANYON OF THE COLORADO

DOCTOR RAYMOND AS A SOLDIER



"THE GREAT WESTERN"

To the presentation and the previous addresses, Doctor Raymond responded with deep feeling. He was visibly impressed by the depth of the friendship that so large a circle of his associates displayed toward him, the spontaneity of their meeting to do him honor, and the high marks of esteem of the foreign

HEIDELBERG, 1859

technical societies. It was planned to conclude the evening with some brief addresses by friends present, but the lateness of the hour made this impossible and the meeting ended at 12.30 a.m.

The dinner and subsequent exercises were characterized by a delightful informality and friendliness, which added to

DOCTOR RAYMOND AS A STUDENT AT FREIBERG

the charm of the occasion, and bringing together many friends from all parts of this country and from abroad, it constituted a memorable event, which, as one speaker happily remarked, we all hope will be repeated in honor of Doctor Raymond every ten years until the allotted three score and ten extend to a century.

In addition to its net output of 51,749,233 lb. of copper, the Utah Copper Company last year recovered, after all smelter deductions, 20,862 oz. of gold and 198,943 oz. of silver, or an income of over $516,000 from the gold and silver contained in its ore.

Gold Dredging in Bolivia

It has long been known that there is a rich unexplored goldfield in the interior of Bolivia. The following is condensed from a report of Secretary of Legation Alexander Benson, La Paz, Bolivia. Since the times of the Incas, rough trails have existed between the ancient Inca centers of Titicaca and Cuzco and the forest-clad ravines of the eastern Cordilleras, which culminate in the important river of Kaka close to the small village of Guanay. The most important of these precipitous valleys have been formed by the rivers Tepuani, Mapiri, Challana and Coroico. It is accepted that the ancient trails leading into these valleys were built by the Incas for extracting gold from the immense deposits of gravel existing in every one of these valleys.

A great amount of work was done by these people, but nothing has been done in modern times save by an occasional hardy prospector. It is impossible to ascertain what production was made by the earlier workers, but it is a well known fact that large amounts were taken out by them. The gold was probably derived from ancient glacial deposits.

The upper rivers are difficult to work because of the great boulders with which they are strewn, their torrential nature, and the floods which sweep their course each year. They come together to form the river Kaka, just below Guanay, and there the river runs through a succession of narrow cañons, where there is but little opportunity for the gold to settle. After about 20 miles of these cañons, Incahuara is approached, and the Andean slates give place to a sandstone formation. Below Incahuara the cañons of the Kaka give way to comparatively open, rolling country, and the river widens out into great flats of shallow depth, often a couple of miles wide, depositing its gravel in large islands and bars surrounded by sluggish backwaters and covered by dense vegetation and heavy timber. Here the current flows only at about four miles per hour, and the gold and heavier particles of sand and gravel find a resting place.

This district may be easily prospected by drills. The operation of a dredge on the river would be perfectly feasible, as it is rare that a boulder is encountered which could not be easily lifted by the buckets of a modern dredge. The depth of bedrock below the water level is not now known, but it probably does not lie at any great depth. The bedrock consists of sandstone, an ideal bottom for dredging operations as it can be cleaned and thoroughly scraped by the buckets. The most serious difficulty in the way of developing this auriferous belt is that transportation is difficult and the cost high. Rough mule trails are the only means of entering this region, and the transportation of heavy machinery is well nigh impossible until roads of some kind are built.

The Bureau of Mines Bill

SPECIAL CORRESPONDENCE

The Bureau of Mines bill, passed by the House some time ago, was acted upon favorably by the Senate on May 2. This puts the measure through both houses, though with minor alterations in the Senate, and sends it to conference for the further working out of points of difference.

Plans had been carefully laid in advance by the bureau advocates in order that the coup of May 2 might be made successfully when the proper moment arrived. Late last week the consent of the Senate was obtained to the shifting of the bill from the calendar under Rule IX to the calendar under Rule VIII. This gave it a semi-privileged status analogous to that of bills on the "unanimous consent calendar" of the House and made it possible to bring up the measure during the morning hour, whenever the assent of the upper chamber could be obtained.

When the favorable opportunity for demanding a vote arrived early on May 2, opponents were not well prepared for resistance, as the early pressing of the bill to passage had not been anticipated. Opposition has not been firmly organized. The principal speech in opposition to the bill was made by Senator Root, of New York, who, while he had comparatively little to say in opposition to the functions now proposed for the bureau, thought the step taken a dangerous precedent and to be objected to on the ground that it constituted an evasion of the field of States' rights. Mr. Root was not particularly well prepared to deal with the question on its own merits, and this was obvious as he gradually developed his argument. The advocates of the bill were, however, too well organized to admit of effective resistance and the bill passed with only a comparatively brief discussion. This was by no means as thorough a consideration of the measure in any aspect as that which had been afforded in the lower House some weeks ago.

That some agreement on the Senate amendments will be reached, no one appears to doubt, inasmuch as the differences between the House and Senate drafts are not very great. The Senate draft is the one which is expected to be sent in substantially its present form to the President. Little doubt that Mr. Taft will give it his approval is entertained. There is already some tentative speculation as to the personnel of the new bureau, and especially as to the choice of a chief.

The Pittsburg Coal Wage Agreement

SPECIAL CORRESPONDENCE

The wage scale for the thin-vein district of Western Pennsylvania was settled at midnight April 29. Eight mines had signed provisionally, most of their miners going back to work, and the remaining mines resumed this week. The advance from 90 to 95c. per ton for pick mining with corresponding advances for machine mining, day work, etc., had presented no difficulties, the issue being wholly as to conditions to govern mines using the new or "permissible" explosives. In a recommendation by the State Mining Bureau, 14 mines had been designated as gaseous, and the use of black powder in them was prohibited, certain "permissible" explosives being designated for use. There are prospects that from time to time other mines will be so designated by the State department.

The issue was as to these mines. The men claimed the new explosives so broke the coal as greatly to reduce the proportion passing over the standard 1¼-in. screen, and demanded payment on a mine-run basis in these mines, the screened-coal rate to be converted into a mine-run rate on the traditional basis of 65 per cent. of 1¼-in. screened coal to mine-run. The operators claimed (1) that to go on a mine-run basis would produce carelessness on the part of the men, resulting in excessive breaking up of the coal and the loss of the Lake trade, since it is on a screened basis, and at a season when the resultant slack is in poor demand; as to coal for local commercial use it was admitted that such an issue has been relegated to the background through the rapid introduction in recent years of automatic stokers; (2) that the men have not used the new explosives intelligently and that with proper use the coal is not necessarily broken more than with black powder.

The compromise was effected on a basis proposed by National President Thomas L. Lewis, who is considered to have scored a victory over District President Francis Feehan, who has opposed Lewis at all points since their rupture some time ago.

The compromise as to the mines at issue is on the basis that payment shall be put on the mine-run basis as soon as mine-run scales are installed, this to be within 15 days. Thereafter, and within 60 days, tests are to be made, the men to do their best in using the new explosives, and if as to any mine such test shows that 64.64 per cent. of lump coal is produced, such mine shall go on the screened-coal basis.

It has been clear that the real issue hinged upon the manner of use, by the men, of the new or "permissible" explosives, and the operators have accepted a responsibility in leaving the settlement to tests which will depend directly upon the character of the men's work. No doubt this will be performed under very close supervision, so as to avoid a repetition of the unfortunate experience of the Charleroi test. The full text of the agreement reached at midnight April 29 is as follows:

THE AGREEMENT

(1) That the price of mining from April 1, 1910, to April 1, 1912, shall be 95c. a ton of 2000 lb. for pick-mined, 1¼-in. screened coal in the thin-vein district of western Pennsylvania, and a relative advance for mine-run coal.

(2) That the price for machine mining be increased 4c. per ton on screened lump coal in western Pennsylvania thin-vein.

(3) The inside day wage scale shall be advanced 5.55 per cent., with the conditions of the Columbus day-wage scale agreement of 1898.

(4) That all narrow deadwork and room-turning and all other day labor shall be paid a proportionate advance with the pick-mining rate.

(5) All mines where new or permissible explosives are used shall operate on a mine-run basis. At the operators' request a practical test shall be made at any of the mines where the new or permissible explosives are now used. Should such tests show that 64.64 per cent. lump coal is produced with proper shooting of coal by the use of new or permissible explosives, then such mines may return to the 1¼-in. screened-coal basis; tests shall be made as soon as possible or within 60 days after the installation of scales; to keep operating 1¼-in. coal until run-of-mine scales are put in. Run-of-mine scales shall be installed as soon as it is possible to secure the same, or within 15 days. The conditions under which tests shall be conducted shall be mutually agreed to by the district officers of the United Mine Workers of America and the operators affected, under the following general conditions: (1) That the test be interpreted to mean that the coal shall be properly shot; (2) that it be handled with care, both parties recognizing the fact that the coal must be marketed, and that the wages of the miners depend upon the marketability of the coal and also the profits of the operators; (3) that it shall be weighed run-of-mine on the tipple and also weighed screened coal; (4) the tests shall be made when the mine is in ordinary operation. At all mines where new or permissible explosives are used, the companies shall furnish them to the miners at the same cost per ton of coal produced as black powder.

(6) The prices and provisions of the general contract shall apply to all mines operating in what is known as the Pittsburg district, operated by companies parties to this agreement. The prices to be paid at the Scott Haven mine to be referred to and decided by the International executive board of the United Mine Workers of America.

(7) Pending final negotiations of the details of the wage agreement for this district, the mines shall resume operations.

(8) That a joint meeting of the representatives of the operators and miners shall be held at the earliest possible date to agree upon the details of the wage contract.

Reverberatory Practice at Cerro de Pasco

In connection with the discussion of Dr. L. D. Rickett's paper on "Reverberatory Practice at Cananea," presented before the Institution of Mining and Metallurgy, S. J. Gormly, superintendent of the Cerro de Pasco smeltery, submitted[1] the following interesting information regarding reverberatory-furnace operations at La Fundicion, Peru.

"Early in 1907, the building of a reverberatory plant for treating the flue dust and a portion of the fines from the Cerro de Pasco ores was proposed and approved by General Manager R. H. Channing, Jr., although the operation of a reverberatory furnace at an altitude of 14,000 ft. was seriously questioned by many.

FURNACE DIMENSIONS

"Orders were placed in the United States for the necessary brick in May, 1907, and the first furnace was completed and started operation on April 26, 1908. The principal dimensions of this furnace were: Hearth, 19 ft. by 60 ft.; grate, 17 ft. by 7 ft.; smallest section in flue, 4 ft. 2 in. by 4 ft. 6 inches.

"Owing to the high volatile content of the coal used (the approximate analysis being: water 6.2 per cent., volatile 39, fixed carbon 33.7, ash 21.1), and the unusual atmospheric conditions under which we were working, it was considered advisable to build the furnace with an exceptionally large area, to permit the free passage of the gases at a slow velocity, in order to get a complete combustion inside the furnace. Consequently the furnace was built with a clearance above the bridge wall of 3 ft. 5 in., and a clearance above the slag line of 4 ft. 5 in. The opening under the verb (i.e., the opening at the throat of the furnace) above the working slag line, was 6 ft. by 2 ft. 1 in. This dimension was subsequently increased to 7 ft. by 2 ft. 1 inch.

"Owing to the free coking quality of the coal, it is necessary to rabble the fire constantly, and to facilitate this there are in the back of the furnace five circular openings which are closed by rolling

[1] *Bull.* 67, I. M. M.

doors, held in place by suitable guides. The furnace first built was connected to the main stack and was intended to operate on natural draft, but in this it failed, and it was necessary to equip it for forced draft.

WATER JACKET AT BRIDGE WALL

"Under forced draft the high ash content of the coal made it clinker badly, the clinker adhering to the sides of the firebox, particularly to the bridge wall, so that it required two or three hours to grate, and even in that time it was not possible to remove it all. This difficulty was satisfactorily overcome by putting in a water jacket at the firebox side of the bridge wall, extending the entire width of the furnace, so that the feed-water and overflow connections are outside of the furnace. The jacket has a 4-in. water space and extends below the grate bars, so that the heavy laps and riveted joints do not come in contact with the fire.

"The jacket answers a double purpose in that it protects the bridge wall and at the same time prevents the adhesion of clinkers. The introduction of steam under the grate was tried for a time, in hopes that it would soften the clinkers and thus aid in the grating, but this was finally abandoned, when a tilting grate, designed by Mr. Ross, assistant superintendent, was introduced. By means of this tilting grate, by which the entire fire is dropped from one-half of the firebox at once, the grating can be accomplished in 15 to 20 minutes.

A NINE MONTHS' CAMPAIGN

"This furnace in nine months' operation, after which it was closed down for repairs to the flue and roof, smelted 19,383 tons of calcines, 1996 tons of McDougal flue dust, 3833 tons of blast-furnace flue dust and 595 tons of limestone. There were burned 10,847 tons of coal, a ratio of coal to dry charge smelted of 1: 2.38. The coal here given includes the coal used in firing the boiler for generating steam to be used under the grates.

"The working of the experimental furnace was so satisfactory that it was decided to increase the plant to five furnaces. The four additional furnaces were built on the same general dimensions as the No. 1, except that the firebox was made 6 in. deeper, to accommodate the water jacket, and 2 ft. longer, so that the firebox on these furnaces is 7x19 ft. Each furnace is equipped with a No. 9 Sturtevant fan, driven by a 20-h.p., alternating-current motor, at 1000 r.p.m. The bricks for the extension of the plant were all made at the company's own brick plant at Cerro de Pasco, and have the following analysis: SiO_2, 95.6; FeO, 2.1; Al_2O_3, 1; MgO, 0.2 per cent.

"These furnaces are now smelting, on an average, 120 to 130 tons per day on a ratio of 2.75 : 1, producing 35 per cent. copper matte and slag of the following composition: SiO_2, 36; FeO, 41.8; CaO, 5.3; Al_2O_3, 3.1; MgO, 0.4; PbO, 2.1; ZnO, 3.4; S, 0.3; Cu, 0.42; Ag., 0.16 ounce.

FURNACE BOTTOMS AND FETTLING

"The furnace bottoms were put in of local sand of the following partial composition: SiO_2, 94.7 per cent.; FeO, 1.3; Al_2O_3, 2.3. The bottoms have never required any repairs or attention. The same material is used for fettling, when such is required, which is seldom, and then only on the top of the bridgewall and in the angles formed by the bridge and side walls. This, no doubt, is due to the position in which the charge-hoppers are placed, being 8 ft. 6 in. between the centers of the discharge openings, and delivering the charge well toward the sides of the furnace, thus keeping the sides from getting excessively hot, as is the case in furnaces where the charge is delivered more in the center.

"I do not feel at liberty to give any detailed cost figures, but will state that our costs compare favorably with those obtained in the best modern practice in the States."

California Oil

SPECIAL CORRESPONDENCE

The Refining and Producing Oil Company has taken over the refining plant built by the California Petroleum Refineries, Ltd., at Oilport, near San Luis Obispo at a cost of $1,000,000 and intend to enlarge the plant, besides building another pipe line from Bakersfield to Oilport. In addition, extensive tracts of oil lands in Santa Barbara and Kern counties pass into the hands of the new company. A $4,000,000 bond issue has been authorized for building new pipe lines and for the purchase of tank steamers. The principal stockholders are J. I. Lamprecht, of Cleveland; T. N. Barnsdall, of Pittsburg; Henry J. Crocker, of San Francisco and J. C. Yancey, of Portland, Oregon.

The Kern River Oil Fields of California, Ltd., a British syndicate, has purchased the holdings of the Imperial Oil Company and the Thirty Three Oil Company at Bakersfield for about $2,500,000. This is said to be the largest oil deal in the history of the State. These two companies have paid to date $2,670,000 in dividends and the yearly product is stated to be about 2,000,000 bbl. W. S. Boggs will be retained as manager. It is claimed that only one-third of the land purchased is drilled.

The Producers Transportation Company has contracted with the Llewellyn Iron Works and the Lacy Manufacturing Company for steel tanks with a total capacity of 1,250,000 bbl. Ten large storage tanks will be installed at once in the Midway-Maricopa field where the production exceeds the present capacity of the tanks and pipe lines. Large storage tanks will also be provided at Santa Margarita in San Luis Obispo county, within 25 miles of the coast and beyond the reach of the big guns of warships. Storage here will have the additional advantage of a comparatively cool climate. It was originally intended to build concrete storage tanks at Santa Margarita, but a drop in the price of steel decided the company to build 55,000-bbl. steel tanks instead.

The companies in the Independent Agencies have looked forward with much interest to the announcement of the price of oil to the producers for February. The delay was due to bookkeeping difficulties and hereafter the price will be given out on the fifteenth of the month and the checks mailed on the twentieth. The price for February was 44.4c. net to the producers and this low price was largely due to certain old contracts, some as low as 19c. per bbl., which will soon expire, and will not be renewed. The average price of fuel oil may not exceed 50c. per bbl. for some months as the production now exceeds the capacity of the present pipe lines although the market has not been glutted. The Associated pipe line into the Midway-Maricopa field will soon be finished.

During March, the output of oil in California was 5,598,745 bbl., the greatest monthly output in the history of the State.

Of the yearly fuel-oil product, the Southern Pacific Railroad Company consumes about 11,000,000 bbl., the Santa Fe 5,000,000 bbl. and it is estimated that the Arizona towns and mines will consume 4,500,000 bbl. yearly when it can be supplied through a pipe line, not taking into account the oil used by the railroads. The Western Pacific will soon also be a large consumer. Even now in Arizona with coal from New Mexico at from $6.50 to $8 per ton, oil is used in nearly all the large plants.

The oil in the 300,000-bbl. concrete reservoir of the Standard Oil Company at Point Richmond caught fire on April 21, forming one of the most spectacular fires seen here in the last few years. The water in the bottom of the reservoir finally became heated and the burning oil bubbled over the sides of the reservoir and ran down, a seething mass of flame, for over a mile, destroying a part of the Santa Fe track. A loss of $170,000 was sustained.

A deposit of soda has been found at the terminus of the projected road of the Uganda railway, Central Africa. It is described by the discoverer, F. Shelford, as being a lake about ten miles long by two or three wide. The water is only a few inches deep and covers a hard surface of soda resembling pink marble. The soda was found to be of considerable depth.

Old Mining Camp of Pozos, Guanajuato, Mex.

Little Attention Has Been Paid to This Camp, Though It Has Produced Several Bonanzas; Patio Process Now Being Replaced by Cyanidation

BY H. A. MEGRAW*

In the present state of metal mining in Mexico, with so many of the large properties in the hands of foreign interests and strangers searching in every corner of the republic for mines, new or old, which may be worked profitably, it is rather rare to find a well worked district which has never received that careful examination which is generally accorded the more important camps by those in search of real mines. According to the best obtainable data, the camp of Pozos has never even been visited by many foreigners, and none of these have inquired into it thoroughly. This seems strange in view of the fame the district has enjoyed from time to time due to the production of bonanzas, several of the large mines having enjoyed periods of production of rich ore which attracted the attention of the whole republic.

The mineral district of Pozos is situated in the eastern part of the State of Guanajuato, 10 km. south of the town of San Luis de la Paz. The latter is the *cabecera,* or capital of the district of Cerro Gordo, which includes the district of Pozos and several other less known camps. Pozos is about 120 km. northeast of the city of Guanajuato at an elevation of about 7500 ft. above sea level. The climate is temperate, but the winter season generally brings rather cold weather, due to the north winds to which the camp is exposed, the temperature often falling below the freezing point.

Generally speaking, the district is dry, rains being rare and even the rainy season failing to bring the heavy showers usual in the plateau of Mexico. Communication is established by means of a branch of the Ferrocarril Nacional, which connects Pozos and San Luis de la Paz with Rincon, a station on the main line just north of the city of Dolores Hidalgo.

History of the Camp

The mines of Pozos have been known since the early part of the eighteenth century, the tradition being that several of the mines, notably the Santa Brígida and Ocampo, were worked by the Jesuits, their possession being terminated by the expulsion of their order from the country in 1767. After this time, the mines were worked in a desultory fashion, until 1844, when they were completely abandoned. In 1871 work was again undertaken, the first step being the denouncement and active development of Santa Brígida, which in 1873 passed into the hands of the Parkman family.

The Parkmans, a family established by the settlement of an American in the city of Guanajuato, became a powerful factor in local mining circles and acquired large interests, not only in Pozos, but in the district contiguous to the city of Guanajuato, where they were best known as the owners and operators of the Sirena mine and the Hacienda San Francisco de Pastita, both of which are now owned by the Guanajuato Consolidated Mining and Milling Company, an American corporation with its home office in New York. The Parkman family has long since ceased to be of importance in commercial circles, although they still hold a large part of the Santa Brígida mine.

The fame of Pozos as a producer, began to grow in about 1880, and by 1888 many companies had been formed and were progressing successfully. Among these were the Cinco Señores company, which included the mines of La Joya, Nayalito and Justicia. Up to 1895, this company had divided among its stockholders more than 3,000,000 pesos. To the same epoch belong the mines of Angustias and Argentina, which are credited with dividends amounting to over 2,500,000 pesos. Many other mines have been more or less worked and have paid various sums to their owners.

Pozos Valley. Valley Mines in the Foreground, Town of Pozos to the Right and Santa Brígida in the Distance

Patio Process Employed Until Recently

The main dependence of the Pozos mines has always been the high-grade ore, which was shipped to San Luis Potosi and Aguascalientes, involving large expense before the railroad was completed in 1902. Due to high freight and treatment charges, the operators were forced to contemplate treatment of the

*San Luis de la Paz, Guanajuato, Mexico.

ores on their own account and the result was that several *haciendas de beneficio* were established, two in Pozos and several in San Luis de la Paz.

One reason for the selection of the latter town for the establishment of the reduction plants was that water and labor were available, while in Pozos the only water obtainable was that from the lower levels of the mines. This water, being acid and heavily charged with iron salts in solution, was not well suited for reduction work, and, in fact, it is found at this time to be quite unsuitable for use in cyanidation. Possibly the main reason, however, might be found in the fact that San Luis was a well established town, large in comparison with Pozos, and offered commercial and social advantages which made the living there much more comfortable than in the mine town where conditions were naturally more crude.

The earliest plant to be established in San Luis de las Paz was the Cinco Señores, after which the Ojo de Agua, San José and Santa Elena followed, the latter being the property of the Angustias company. Ore and fuel was delivered to the plants by burros until the establishment of the Ferrocarril del Bozo, a miniature railroad, which connects the mines of Pozos and the *haciendas* of San Luis de la Paz with the *hacienda* del Bozo a ranch in the nearby mountains. A lower transportation charge was thus assured on ores, with advantages in the economical supply of fuel.

All of these plants were designed to treat ores by the patio process, some operated entirely by animal power, and others grinding and concentrating by steam power and utilizing the mules only for the amalgamation process.

Cyanidation Coming Into Use

Following the history of all the Mexican camps, the ores at length became too low in grade to permit working by such expensive processes, interest in the camp began to lag, development fell off, and practically all work ceased. In a paper presented to the Sociedad Geológica Mexicana in the early part of 1909, Manuel Balarezo, a mining engineer of the country, said of Pozos:

"This camp had its period of mining delirium from 1890 to 1896, during which period the mines of Cinco Señores, Angustias and Argentina reached their greatest production. Claims were denounced on every hand, reaching parts where the veins were notable only for their absence, following mythical 'continuations or extensions.' Their owners, guided only by the fever of speculation which possessed them, organized more than 50 companies, of which more than 30 were performing actual work. It is needless to say that these companies vanished as soon as the interest stimulated by the bonanza production of the larger mines had ceased, accomplishing the ruin and discredit of the entire district."

In 1909 the Cinco Señores company, desiring to profit by the large tonnage of low-grade ores existing in its workings, established a plant in Pozos for treating these ores by cyanidation, this being the first systematic attempt to apply modern methods to the ores of the camp. This plant is now at work and shows every indication of successful operation.

The Angustias company joined forces about two years ago with the owners of the Dolores mine adjoining, thus making a strong company owning valuable mines and the Santa Elena reduction plant at San Luis de la Paz. The mill had been formerly rearranged in a fashion for cyanide treatment but without any brilliant results and the company redesigned and rebuilt it in the latter part of 1909. It is now successfully and profitably treating the lower grade ores from the mines.

The *hacienda* Ojo de Agua has also been remodeled for use as a cyanide plant, and is about ready to begin work. This mill treats custom ores daily from the Pozos camp, having contracts with many of the smaller mines for the ore supply. The Garibaldi mine is equipped with a simple cyanide plant, which, as the ore consists largely of chlorides and bromides of silver, gives good results.

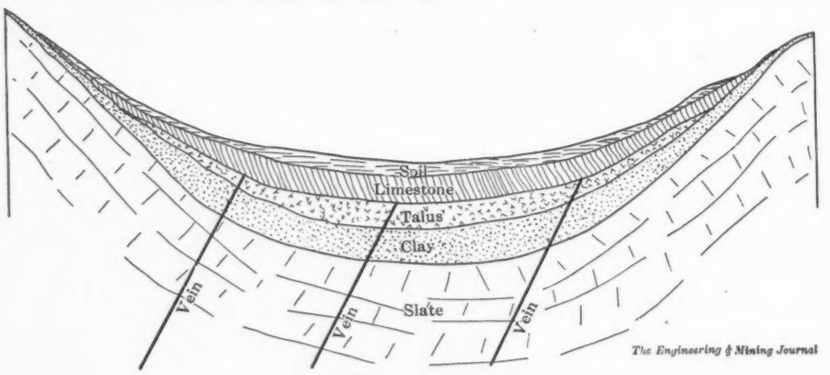
The Santa Brígida company has equipped its property with furnaces for reducing the ores, but these are not at present in operation, the high-grade ore only being mined and shipped.

Experiments are being carried out with the idea of concentrating the lower grade ores, and possibly devising some economical method of recovering the metals from the tailing.

Occurrence of the Ores

The district of Pozos lies in a small valley between the higher hills. This valley measures about 8 km. north to south, and about the same east to west. The veins are fissures in the argillaceous slates, with strike northwest and southeast, and dip toward the southwest. The bedding planes of the slates of the western part of the valley are inclined toward the northwest, and in the eastern part toward the northeast. These bedding planes are often filled and in some places replaced with lime deposits, and occasionally these deposits are so marked as to seem veins although they carry no gold or silver. The veins are usually filled with quartz, which carries the valuable metal deposits.

A bed of clay covers the slates for practically the entire extent of the valley. Over the clay there is a bed of talus, consisting of fragments of porphyry and basalt in some places and in others largely mixed with broken vein matter from the old crests of the veins. This bed is in some places impregnated with the clay and has been so cemented by lime impregnations as to form a sort of conglomerate. Above the talus appears a bed of limestone, thick in the valleys and thinning out near the summits of the hills. The present soil is thick in the valley but does not exist on the higher points.



Ideal Section of Pozos Valley

The veins rarely outcrop, the limestone covering them in most beds, but erosion has exposed them in the cañons where the limestone beds have been sufficiently worn away. The veins of the camp can be divided into two classes, according to the nature of their contained mineral.

In the Western group the ores near the surface consist principally of chlorides and bromides of silver with comparatively large proportion of gold. At depth these veins change their characteristics, the ores being antimony-bearing silver sulphides. The principal examples of this group are the veins of La Joya, Escondida, Trinidad, Dolores, Angustias, San Rafael, Mina Grande, etc.

The Eastern group, including the mines of Santa Brígida, La Reforma, etc., is distinguished by the presence of oxides and carbonates of lead and copper near the surface, and at depth galena, chalcopyrite, native and gray copper with some blende.

The veins are of various widths, the narrowest being a little more than one meter wide, and the stronger veins reaching a total width of 20 m. in some places. The camp contains 17

shafts more than 100 m. deep, the deepest at present being 240 m., or about 780 ft. The veins are found in good condition and in good ore at the greatest depth, which speaks volumes for the permanency of the camp. The topography is generally not favorable for tunnel development, but there is one tunnel, that of Dios Nos Guie, which has a total length of 1060 m., or about 3450 feet.

At present the camp of Pozos seems to be experiencing a sort of mild revival, interest being taken in the work and the reopening of several old properties being considered. That the district is worthy of careful attention seems to be undoubted.

The Whitehorse Copper Belt, Yukon Territory

The Geological Survey branch of the Canadian Department of Mines has issued the report of R. G. McConnell on the Whitehorse copper belt of Yukon territory. This report embodies the result of an investigation of the geology and mineral resources of the Whitehorse district, where important discoveries of copper were made during the early rush in 1897, development work being begun two years later. Little progress was made, however, until 1906, when the rise in copper attracted the attention of capitalists to the possibilities of the district. The Whitehorse copper belt is situated in the southern part of Yukon Territory, about 45 miles north of the British Columbia boundary, and extends along the valley of the Lewes river from a point east of Dugdale on the White Pass railway northwestward to the base of Mount Haeckel, a distance of about 12 miles. Whitehorse, the distributing point of this district, in addition to being the terminus of the railway from the coast is the head of navigation on the Yukon.

Topography

The main feature of the topography of the district is the great valley of the Lewes river. Opposite Whitehorse it has a width of fully four miles bordered by inclosing mountains. The Lewes river is capable of furnishing extensive water power, as the fall of the river at Miles cañon, four miles above Whitehorse, is 16 ft., and in the Whitehorse rapids, nearer the town, 9½ ft.; additional fall could be obtained by damming the head of the cañon. A second possible source of water power is Fish lake, six or seven miles long, situated in a high valley west of Mount McIntyre at an elevation of about 1450 ft. above Whitehorse.

The Whitehorse ores at the time of the investigation in 1907, were being shipped for treatment to smelteries on the coast, transportation charges amounting to from $8 to $10 per ton. These will be reduced when the branch line along the belt from the White Pass railway is completed.

Irregular Distribution of Ores

The width of the copper belt seldom exceeds one mile, and in places is confined to a single line. The distribution of the discoveries along the belt is exceedingly irregular. The croppings follow a series of limestone areas inclosed in granite or lying between granite and porphyrite. Where the limestone is absent the belt is practically barren, and considerable stretches of it otherwise favorable are hopelessly buried beneath heavy accumulations of drift. The rock formations consist, in order of age, of limestone, porphyrites, granites and granodiorites, an extensive system of porphyrite dikes, and finally basalts. Of these only the limestones and granitic intrusives are important economically. The principal orebodies now being developed occur in the limestone close to or adjoining the granite. Though discoveries have been made in the granite at some distance from the limestone, the limited amount of work done on these has so far disclosed no orebodies of commercial value.

Bornite and Chalcopyrite the Most Important Minerals

The principal economic minerals are the two copper sulphides, bornite and chalcopyrite. Tetrahedrite occurs at the Arctic Chief and small branches of chalcocite at the Best Chance and other places. Copper minerals resulting from the oxidation of the sulphides are conspicuous at all the workings, but, except at the Pueblo, are seldom important as ores. Bornite is the leading copper mineral occurring in nearly all the mines and prospects. In the large magnetite orebodies it occurs disseminated in grains and small patches throughout the mass. The distribution is always irregular, certain areas of the magnetite carrying a much higher percentage than others. Lenses of bornite and chalcopyrite, inclosed in a tremolite-garnet-augite gangue, occur at many places along the lime-granite contact. Chalcopyrite is, next to bornite, the most important copper mineral, occurring at all the mines and prospects examined. It is found in grains and small masses, disseminated through the iron orebodies, and is also conspicuous in the altered limestone zones in association with bornite, garnet, augite and tremolite. It is often intimately intergrown with bornite, and both minerals were evidently deposited together.

While the greater part of the chalcopyrite is primary, a small quantity is of secondary origin. Native copper occurs sparingly in grains and small scales along the walls, and in the oxidized portions of many of the lodes. It nowhere forms large masses and is not of economic importance. Cuprite is common at the Pueblo, where malachite and azurite also are found in commercial quantities, largely replacing the primary sulphides in the developed portion of the mine.

Classification of Ores

The Whitehorse copper ores possess all the characteristics of ordinary contact metamorphic deposits, and are referred with little hesitation to that class. The orebodies are irregular in outline, are occasionally banded, and vary in size from small lenticles a few inches across—often completely inclosed in limestone—to masses measuring hundreds of feet in length. Veins, with the exception of thin seams, evidently of secondary origin are unknown.

Magnetite and hematite are widely distributed and occur in large masses, magnetite being especially abundant. Lenses of this mineral ranging from a few inches to 360 ft. in length are found all along the belt, mostly in the altered limestones, but also occasionally in the altered granites. The magnetite aggregates are granular in structure, and as a rule are comparatively pure. Hematite is less common. It occurs in large tabular crystals at a number of the exposures and is the principal mineral in the great Pueblo lode. Limonite exists sparingly at all the mines, but is nowhere abundant.

Gold and Silver Content

Gold in some quantity is present in all the ores, ranging from traces up to several dollars per ton. Free gold in visible grains, though not common, occurs occasionally. Silver is also universally present, the percentage being usually low, ranging from 1 to 3 oz. per ton. Other metallic minerals of less frequent occurrence are arsenical pyrite, stibnite, galena, sphalerite and molybdenite.

The orebodies fall into two classes; those in which the copper minerals are associated with magnetite and hematite, and those in which various silicates are the chief gangue materials. The copper percentage in the silicious ores is higher as a rule than in the iron ores, those shipped up to the time of Mr. McConnell's investigation probably averaging over 8 per cent. None of the orebodies had then been followed to a greater depth than 100 ft. and the question of their downward extension remained to be settled. At the depths reached some of the lodes showed increased and some decreased volumes, while the character of the ore remained unchanged. Being dependent on the limestone, the deposits found in the larger areas were regarded as likely to prove more permanent than those in the small inclusions. The concluding portion of the report is devoted to a comprehensive description of the leading mines and prospects of the district, the geological relationship and extent of the prominent lodes being shown by a number of maps.

Petroleum Development in San Joaquin Valley

Coalinga, McKittrick, Midway and Sunset Fields Contribute to the Production; Encouragement for Capital to Drill Deep Ground

LIMITS NOT YET PROVED

Under the direction of State Mineralogist Lewis E. Aubury, a general reconnaissance of the oil districts of the San Joaquin valley, Cal., has been completed by Paul W. Prutzman, assistant in the field. The State Mining Bureau is now engaged in preparing maps of all the different oil districts in California, and is also at work on a large report in which detailed information will be given of the different districts. The first of these reports is herewith given.

Four Divisions in Coalinga District

To understand conditions in the Coalinga oilfields of California, it is necessary to bear in mind the topography of the country. From the southern extremity of the developed field, the foothills run due north for about seven miles, then turn sharply to the east and run almost due east for about three miles, where they again bend to the north. From the apex of the curve thus formed, a spur of the hills extends in a southeasterly direction for several miles.

This topographical arrangement leaves a plain about six miles square, between the foothills and the spur, surrounded on three sides by the hills and bounded on the south by the railroad. The town of Coalinga is on the railroad and close to the foothills, and, therefore, near the southwest corner of this plain, which is smooth and slopes gently from northwest to southeast.

Oil has been found on the lowest portion of the foothills and extending out for a varying distance from them, on the north and west sides of this plain as well as on the outer or valley face of the foothills where they turn to the north. The East field is that portion lying on the valley slope of the north limb; the Southeast extension on the east or valley slope of the spur; the West field lies on the inner portion of the hills west and south of the plain; the South field is the prospective territory south of the railroad, following the hills for an indefinite distance.

The length of the developed field is about 13 miles and the extension to the southeast is proved for a length of approximately a mile and a half. The width of the actually proven belt varies from three-fourths of a mile at the lower extremity to about two and one-half miles at the widest part, with an average of perhaps two miles.

Extension of the Coalinga field to the north seems to be pretty definitely barred by the operations of the Imperial in sec. 4, T. 19 R. 15, which are said to have resulted in dry holes and in finding an order of formation quite different from that found farther south. Some maintain, however, that the sands at this point lie farther back in the hills, and at least one company is drilling on section 8 in this township on such a theory.

To the northeast, the operations on sec. 12, T. 19, R. 15 have resulted mostly in water wells, but whether this is due to flooding of the sands from above (that is, from higher up on the formation), to the diffiulty of handling surface water, or whether the actual water line has here been reached, it is yet too soon to tell. To the east of the old wells on sec. 29, T. 19, R. 15, operations are slowly being pushed farther out, and it does not appear that any limit has yet been set to drilling in this direction. The same may be said of the work along the outer face of the spur; work is gradually being carried south and east, and while drilling here is deep and correspondingly expensive, the new well of the Coalinga Mohawk offers encouragement in this direction to operators with means enough to carry on this heavy work.

West of sec. 28, T. 19, R. 15 the new well of the Empire on 32 has bridged, in part at least, the gap supposed to exist between the east and west fields, and proves the territory lying immediately west. Figuring from the depths of the Limited wells on 29 and of the Empire (about 2700 ft.), it is evident that the sands here have a sharp pitch to the southeast, and as the formation on 28 also pitches in the same direction, but on a much higher level, more work will be required to finally prove whether the Empire sands pass under those on 28, or whether they rise again to meet them and form an anticline; and in the latter case, whether it will be productive on the west slope. There is still a gap of almost a mile between the Empire well and the nearest producer on the east. When visited this well was producing about 500 bbl. of 18 deg. oil but there was a great deal of sand in the casing, and as this has since been cleaned out it seems likely that reports of considerably larger production at present are correct.

Possibilities of the West Field

The northern line of the old West Side field, along the north line of sec. 31, T. 19, R. 15, is definitely marked by old work, some of the original Coalinga wells having been here; but to the south, the limit has not been set. The Aztec, in the southeast corner of 31, has lately gone into the first sand, and both the California Coalinga and M. K. & T. have lately brought in good producers on sec. 8, T. 20, R. 15. The latter wells are 2800 and 2940 ft. respectively, which indicates a normal degree of dip to the sand both from the north and the west.

This work is the farthest out on the flat, and the old argument as to whether the producing sands extend across the flat and to the wells on the outer side of the spur is yet unsettled. The 2800-ft. well of the Peerless Consolidated on 10, and the deep test of the Claremont on 4, said to be 4100 ft. or more, without oil, would seem to indicate that the western limb of this anticline will not be productive, which corresponds well with the theories in the case.

On the upper, or west side of the West field, production has been carried back beyond the center line of secs. 1 and 12, T. 20, R. 14. These wells are shallow, only 700 to 800 ft., but are good producers of heavy oil, and there is no way of determining how much farther back the profitable sands may extend. On the south side of Los Gatos creek, the formation seems to be rather lower than elsewhere along this back edge, and here drilling has been carried back with good results, well toward the center of 14, and no definite bound to the field so far in sight in this direction.

On sec. 25, T. 20, R. 14, the Coalinga Western has undoubtedly gone back to the upper edge of the productive sands, and while work along the east line of 26 has resulted in some good wells, it seems doubtful whether profitable drilling can be carried much farther to the west here unless, indeed, a lower sand can be found, of which some indications appear in the last well drilled on the old Blue Diamond twenty, in section 26.

Due east of this work, on the eastern frontier, the Nevada Petroleum has a string of good wells down the center line of sec. 30, T. 20, R. 15, at about 2400 ft. Adverse water conditions were encountered here, and No. 1, which had generally been counted as a lost hole, has finally been cemented and put on the pump; these wells appear to be producing 200 to 400 bbl. each, of a medium-grade oil.

Just in the edge of the town of Coalinga, the Valley has a 3200-ft. well which has some oil, but which up to the present has not been freed from water enough to determine its value as a pro-

ducer. If this well can be finished, an area of at least two square miles will be added to known productive territory.

Trouble from Haste and Carelessness

On the much boomed section 6, T. 20, R. 15, operations are rather at a stand. This territory suffered greatly at the hands of certain operators who seemed more anxious to raise the value of their stock than to conserve the value of their property, with the result that haste and careless drilling have brought about serious water troubles. It seems a great pity that such promising territory should be abused and perhaps ruined in this offhand manner, but there is reason to hope that if the operators can be brought to unite on protective measures, a greater part, if not all, of the damage can be undone.

Section 6 is surrounded on three sides by lands of the K. T. & O. company, on which nothing is being done, and the nearest prospecting has been on sec. 12, T. 21, R. 14, where in addition to several old holes, two or three have been drilled within a short time but without result. Opinions differ as to the reasons for this failure, but it seems to be generally accepted that the formation is too much broken to hold out hope for any profitable production. There is now no work under way on the north side of Warthan cañon.

On the south side of the cañon, on sec. 18, T. 21, R. 15, several rigs are at work, and up Jacalitos cañon, but near its mouth, four or five others, but none of this work has yet reached the conclusive stage. Further up, the 1600-ft. hole of the Jacalitos, and the 2800-ft. test of the People's Associated, both dry, seem to stop any extension in this direction, though one rig is still at work on sec. 32, T. 21, R. 15.

Out from the mouth of Jacalitos cañon, but one rig, the Blair, is at work, but this hole is expected to prove up quite a stretch of country if successful. It is now 2000 ft. deep. Two rigs are said to be at work on the Lake side of the Kettleman hills. The Southfield Oil Company has two holes at 1600 and 1400 respectively on the Kreyenhagen ranch, sec. 33, T. 22, R. 16; this is on the old Black Mountain lease, where a little oil is still in evidence in the old hole. South of this, and considerably farther out, the El Cerrito lately quit at 4100 ft. with a dry hole.

Narrow Productive Zone at McKittrick

At McKittrick there is little that is new. This field has had the reputation of being spotty, but later work has shown that it is merely narrow and that the producing strip is not altogether straight. The upper or southwest boundary of the field was shown years ago, a string of dry holes having been drilled all along this side, and extension to the southeast sems to be barred by the deep dry holes of the Provident on the old Dabney lease.

Many of the shallow wells at this end of the field have gone over to water, but the old Shamrock gusher, one of the most profitable wells ever drilled in this State, is still putting 800 or 900 bbl. of clean oil into the tank every day. All the property north of this has held up remarkably well, and acre for acre there is probably no better producing ground in any of the fields than a narrow strip running northwest from the Shamrock to the East Puente on 11. The Jackson has a good heavy-oil producer at this end, and the K. T. & O., a couple of fair wells on the old Foltz lease, but north of this all work has resulted in absolute failure and there seems little or no hope of extending production in this direction. Some prospecting is being done a little to the northeast and therefore farther out toward the flat, and some five miles northwest on the Tembler ranch a small, shallow sand pool has been found, but this seems to be limited in extent and is almost surrounded by deep failures.

The topography of the McKittrick field somewhat resembles that of Coalinga in that there is a spur from the main range of hills extending in a southeasterly direction from the main range north of the developed field. Some prospecting has been done on the west, or inside of this spur, but without encouragement. On the outer or valley side of this spur, the United States Oil and Mining brought in a small producer some time since, and lately the Nacirema got a 40- or 50-bbl. well of 12-deg. oil in this same section (sec. 6, T. 30, R. 22), and there seems some hope of a narrow belt of heavy-oil territory on the outside of this spur. The wells drilled between the spur and the main range of hills on the flat near Olig station, got nothing but water, and it seems quite certain that the rising limb of the outer anticline is barren.

The Midway Field

From the southernmost wells in McKittrick to the low divide which separates McKittrick from Midway, is but a couple of miles, and from this divide an uninterrupted view of a most remarkable scene of prospecting is presented. Midway, like Coalinga and McKittrick, consists of a stretch of the lowest foothills with a spur extending in a southeasterly direction, leaving a generally flat plain falling toward the south; in Midway, however, this plain is of much greater extent than at either of the other fields.

The most northerly development which has produced any oil is on sec. 14, T. 31, R. 22, where the Bear Creek has an oil of about 14-deg. gravity at about 1500 ft. A mile southwest of this, at about the center of the south line of 15, the Barnsdall, Drake & Yancey Company has a heavier oil at about the same depth. The development farthest up the sand is on the east line of 27, where the Cunningham and Maxwell outfits have each a very heavy oil at about 1600 ft. Southeast of these wells the Amber has a well and the Santa Fe and Associated have several, all at a depth not much greater, and with oil ranging about 16 deg. The strike of the producing formation is apparently about southeast; and following northeast down the dip from any point the depth, of course, increases, production per well appears to increase and the gravity of the oil rises. The Pioneer Midway has a 2500-ft. well on the southwest corner of sec. 30, T. 31, R. 22, while the Mays Oil Company's flowing well, lately brought in, is one-half mile east, on the center of the south line of this section: this is said to produce oil of 24-deg. gravity.

The southwest corner of this township, sec. 31, T. 31, R. 23, seems to be well up toward the edge of the producing sand. Here a Santa Fe well is flowing about 800 or 900 bbl. of 21-deg. oil from a depth of 1400 ft. The formation appears to dip sharply here, as the nearest well to the east, less than a quarter of a mile distant, is about 2000 ft. deep, and a Hawaiian well near the center of the section is over 2300 ft. Near the center of the west line of 32, the next section, the California Midway has a well flowing by heads at about 2800 ft. In fact, all the wells in this ground flowed more or less when first brought in, though this does not seem to last long. There is no production in township 31 east of this well.

Midway Oil Belt One Mile Wide

The producing belt extends across T. 32, R. 23 almost from corner to corner, and has been proved for a width averaging a mile. Here are the older Midway wells; Chanslor & Canfield, Burks, Crœsus, Mountain Boy, Mascot and others. Sections 23, 24, 25 and 26, comprising what is locally known as "Twenty-five Hill," are thickly drilled, but some trouble has been met in handling this territory and the actual production of parts of it have hardly met the first expectation of the operators.

The most interesting new developments in the Midway section are at the southern extremity, where the Standard has a fine flowing well and a couple of smaller ones at about 2400 ft. near the center of sec. 30, T. 32, R. 24, and northeast, or directly across the formation, a well near the center of 28 about which little could be learned. All sorts of extravagant stories are afloat about the production of this well on 30; it appeared to be doing about 1000 bbl. per day and is said to be a steady producer. The well of the Honolulu, which started off as a gasser and turned to oil, is almost due northeast on section 10. This well is still being worked on and flows by heads; it is said

locally to be making about 500 bbl. and is producing a 28-deg. oil. This well is on the outer flank of the spur range, and hardly proves up the territory intervening between this section and Moron, though taken in connection with the Standard's gas well on sec. 26, T. 31, R. 23, it creates a strong probability that production will be had along this side of the spur. This gas well would appear rather to be on the crest of the secondary anticline.

THE SUNSET DISTRICT

At Sunset the hills bend sharply to the east, and there is no spur range. The original wells were in the corner of this bend and rather high up on the formation. Most of these old wells, south of sec. 2, T. 11, R. 24 have been abandoned, though the Union is still pumping a few which have been stripped of their derricks. These wells were shallow, from 600 to 900 ft., and as there was a good deal of pressure the sand appears to have blown itself out. New development has been largely to the north, the best of the new wells being those of the Wellman, Ethel D, and K. T. & O. along the north line of sec. 1, T. 11, R. 24. The production of these wells has been exaggerated, yet making due allowances they are indeed healthy producers, and as they are brought in at about a thousand feet, the territory looks good. A short distance to the southeast, two or more operators have gone to about 2200 ft. before reaching the sand, and have not yet reached the stage where the capacity of the sands at this point is known; but if this sharp dip is maintained work in this direction does not look as promising as it did some time since. However, it is quite possible that this drop in the formation is only local, and extension to the east will not be barred until further results are obtained.

Several rigs are now working along the easterly turn of the hills, following in general the center line of T. 11, R. 23 and T. 11, R. 22, and while no oil has yet been found, there are hopes of an extension in this direction. Some of the old work, while it was probably too far back to have ever been profitable, indicated that the formation which produces at Sunset extends unbroken in this direction, though whether it carries profitable quantities of oil cannot, of course, be known.

Zinc Smelting Capacity of the United States

The accompanying table gives the number of furnaces and retorts of the active zinc-smelting works of the United States at the end of 1909. The list includes two or three works that were not in operation in 1909 and will soon disappear doubtless from the active list.

ZINC SMELTING CAPACITY OF THE UNITED STATES.

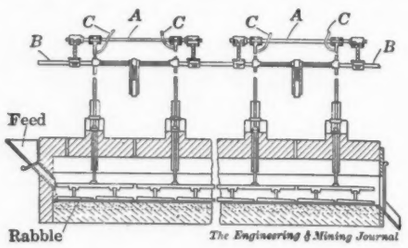
Name.	Location.	Furnaces.	Retorts.
American Zinc, Lead and Smelting Co.	Deering, Kan.	6	3,840
American Zinc, Lead and Smelting Co.	Caney, Kan.	6	3,648
Bartlesville Zinc Co.	Bartlesville, Okla.	6	3,456
Bertha Mineral Co.	Pulaski, Va.	10	1,400
Chanute Zinc Co.	Chanute, Kan.	4	1,280
Cockerill Zinc Co.	Altoona, Kan.	6	3,840
Cockerill Zinc Co.	Bruce, Kan.	4	896
Cockerill Zinc Co.	Gas City, Kan.	4	2,560
Cockerill Zinc Co.	La Harpe, Kan.	3	1,856
Cockerill Zinc Co.	Nevada, Mo.	3	648
Cockerill Zinc Co.	Rich Hill, Mo.		
Edgar Zinc Co.	St. Louis, Mo.	9	2,000
Edgar Zinc Co.	Cherryvale, Kan.	24	4,800
Granby Mining and Smelting Co.	Neodesha, Kan.	6	3,840
Grasselli Chemical Co.	Clarksburg, W. Va.	10	5,760
Hegeler Bros.	Danville, Ill.	2	1,800
Illinois Zinc Co.	Peru, Ill.	7	4,640
Lanyon-Starr Smelting Co.	Bartlesville, Okla.	6	3,456
Lanyon Zinc Co.	Iola-La Harpe, Kan.	15	9,740
Matthiessen & Hegeler	Lasalle, Ill.	5	4,380
Mineral Point Zinc Co.	Depue, Ill.	5	3,920
National Zinc Co.	Bartlesville, Okla.	4	2,432
New Jersey Zinc Co.	Palmerton, Penn. / Bethlehem, Penn.	30	5,104
Pittsburg Zinc Co.	Pittsburg, Kan.	4	910
Prime Western Spelter Co.	Gas, Kan.	14	8,584
Sandoval Zinc Co.	Sandoval, Ill.	4	896
United States Zinc Co.	Pueblo, Colo.	6	1,440
United Zinc and Chemical Co.	Iola, Kan.	6	2,784
United Zinc and Chemical Co.	Springfield, Ill.	2	640
		211	90,550

There was but little increase in the smelting capacity in 1909, the capacity being already in excess of the immediate requirements and conditions being unfavorable to lead any of the smelters to make provisions for the future. Such additions as were made in 1909 were chiefly for the completion of new plants of which the construction had been begun in previous years. Thus, at Depue, Ill., two blocks, comprising 1520 retorts, were added, and at Danville, Ill., one block, comprising 900 retorts; at Caney, Kan., half a block, comprising 288 retorts, was added. The Lanyon-Starr Company, of Bartlesville, Okla., has two blocks, comprising 1152 retorts, which have never been fired. So far as we are aware, no plans for the construction of new works, or further additions to smelting capacity are now on foot.

Hall Roasting Furnace

A roasting furnace of the reverberatory type in which the ore in the form of concentrates is conveyed across a hearth by a system of mechanically-operated rabbles was patented by Benjamin Hall, Nevada City, Cal., Jan. 4, 1910, (U. S. Pat. 945522.) The accompanying figure is a longitudinal section of the furnace.

The ore is fed from a hopper to the roasting chamber across which swing pendulums with rabbles. It will be noticed that the rabbles are tapered with the wider and thicker end toward the feed hopper, and as they pass through the ore, it slides forward from one rabble to the next, until the ore reaches the discharge door of the chamber. The pendulums are secured to a shaft *A*, and given the swinging motion by eccentrics driven from the shaft *B*. Metallic tubes are used for the pendulums, which are kept cool by connecting them with a flexible hose to cold air or water-supply pipes *C*. The furnace bottom is shaped to conform to the arc of the pendulum.



HALL ROASTING FURNACE SHOWING RABBLES

Prussian Silver Mines at St. Andreasberg to be Closed

It is reported that the Prussian Secretary of Commerce and Industry has ordered the fiscal silver mines at St. Andreasberg in the Harz mountains to be permanently closed this spring. The mines had been run at a loss for a number of years and were kept going at heavy expense solely for the purpose of furnishing employment to the mining population of the town. As all prospecting work gave negative results, it was found necessary to take this step and find other work for the men. The water power heretofore used for mining and ore dressing will be leased for manufacturing purposes.

According to Lindell P. Bates, oil-bearing strata extend for many miles along the western shores of Peru, where they have been worked for oil in several localities. The present producing fields are those of Negritos, about 40 miles north of Payta; Lobitos, 60 miles north of Payta, and Zorritos, 30 miles south of Tumbez.

Ore Dressing in the Coeur d'Alene District—X

Concentrates Handled in Wheelbarrows and Carts. Installation of Tailings Plants. Overloaded Machinery. Résumé of General Practice

BY EDWARD S. WIARD*

Having covered in detail the milling methods used in the Cœur d'Alene district, in this last section I shall treat of the methods of handling the concentrates, and give a brief résumé of the previous articles.

Loading Concentrates

At the old Last Chance mill the jig concentrates discharged into double square bins resting on the lower floor of the mill. The sides of the bins were 5 ft. high. The entries to the bins were closed by removable boards, held in place by a scantling wedged against the edge of the top board and a floor timber above. The boards were set in grooves at the sides of the entries, and to prevent leakage strips of burlap were laid on the edges. By driving the scantling against wedges placed on the top board, the boards were pressed down firmly on the burlap strips and the entry was thus made water tight. Each bin was capable of taking care of 24 hours' accumulation of coarse concentrates. The overflow water passed to an outdoor tank for further settlement.

When the bin was full it was drained by drawing plugs; the boards closing the entry were removed and the concentrates taken out with a wheelbarrow. These wheelbarrows were massive affairs made in the mine shops. Some of the loads the loaders wheeled to wagons on wagers were staggering. I remember seeing one wheelbarrow which with its load weighed 2350 lb. As the wagons backed up to the mill it was necessary for the loader to turn the wheelbarrow over its end without tipping sidewise, so some idea can be gained of the strength and dexterity required for trundling out this load.

In the Last Chance bins it was frequently necessary to use false spouting to fill all parts of the bin uniformly. At the Mammoth mill bins of a similar type are made sufficiently deep so as to render this unnecessary. The Mammoth bins are closed by two heavy sheets of timbering made of a double thickness of 1½-in. lumber, each being reinforced at the back by two vertical 6x6-in. timbers. After the contents of a bin are removed the doors are placed in position with their outer edges behind 8x8-in. posts. The doors are tightened to place by two wooden swing bars swiveled on bolts projecting from the face of one of the doors near the top and bottom. These bars swing into slots cut in the sides of the 8x8-in. timbers and are driven home with a sledge. The doors are about 3x6 feet.

Type of Concentrate Bin Now Used

The most popular form of concentrate bin is a long narrow affair separated into pockets at the supporting bents, which are placed 5 or 6 ft. apart and framed from 8x8-in. to 12x12-in. timbers. The bins are double and placed back to back. They are built with the bottom sloping from back to front but there is no side or false hoppering. The bins are raised a sufficient hight above the floor so that the cart shown in the accompanying illustration may be run under the edge.

At this point and midway between bents a circular hole is cut about 4 in. in diameter. The hole is closed by a circular disk of steel plate which is riveted to a handle swiveled on a pin placed back of the bin opening. The gate handle projects from the front of the bin and in addition to the pin is supported by two horizontal adjustable guides which keep the disk pressed against the bin. To open the gate the handle is swung to one side or the other. The bins are drained by pulling plugs. The hoppers are filled successively by adding pieces of curved liner to the fixed spout entering the end of the bin. The sloping bottoms of the bins do not come down to a sharp point but end in a horizontal board of sufficient width to accommodate the circular bin opening and the gate apparatus.

Ore Carts

The spokes in the concentrate cart should be observed. Round spokes for this style of cart were tried but they were found to give away when the wheels were twisted in turning the cart into the box car. The bottom of the cart is provided with a small section of fine screen to further assist in draining the water from the concentrates. The function of the rockers mounted on the front of the cart will be readily understood—the cart is dumped by turning it end over and rolling it on the rockers. In front of the bins a drain is provided to carry off to settling tank drainings from the cart and leakages from the bin. The coarse concentrates as loaded in the box cars contain between 3 and 4 per cent. moisture.

Slime Concentrates

The slime concentrates are run into shallow bins which are filled alternately. At the Mammoth mill one of these slime bins was 4x15 ft. and 3 ft. deep at the discharge end. At the end where the stream of concentrate poured in, the tank had been built up to a depth of 4 ft. inside. This permitted the bin to be filled at the discharge end without overflowing at the receiving end. The overflow was through a passage 22 in. wide. The bin was built of 2¼-in. dressed lumber reinforced by 4x6-in. timbers placed about 4 ft. apart along the sides, and two ½-in. tie rods passed through each pair of timbers and the body of the tank. When these tanks are full they are beaten by a ball suspended from the floor above by a rope. This assists in settling the slime and bringing the water to the surface. At the Morning mill a buffer, on the plunger rod of an air drill, is used for the same purpose. The drained contents of the slime bins are shoveled into carts or wheelbarrows. Loading of concentrates is done entirely by contract, at 9 to 17c. per wet ton. At most of the properties more is paid for loading slime than jig concentrates because it generally has to be shoveled out of the bins, whereas the latter does not; in others a flat rate of from 9 to 12c. per ton is paid regardless of the difficulties of loading.

The Federal Company's shipping products go to the sampling works at Wallace. At this place the Federal company maintains an assayer and the American Smelting and Refining company does likewise. Differences in checking results above a certain limit are submitted to an umpire; below this limit they are split. The other properties either maintain a watcher at the smelteries and check the sample which he forwards to the mine or else dispense with him and content themselves with checking the samples which the smelters return to them.

Retreatment of Jig Tailings

This subject has gained in importance in the district of late years for it has begun to be recognized that the bullion loss from the jigs may be twice as high as that from the sands and slime department. At the Last Chance mill and at the Bunker Hill plant nearby there are enormous accumulations of jig tailings. About 1905 the Bunker Hill company began to experiment with its dump, estimated to contain 800,000 tons of tailings. Twenty-eight samples were taken. The sample pits were from 4 to 28 ft. deep. A sizing test of the samples taken showed that the material increased in richness

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with decrease in size, but that the quantity of material decreased as the size decreased. The greatest amount of lead and silver was found in the material which would pass a 10-mm. round-hole and be retained on a 7-mm. screen.

Experiments Conducted

Four sets of experiments were undertaken:

(1) Whole tailings were fed to a bull jig with a single compartment 36x60 in. The best recovery obtained by this operation was 65 per cent. The tonnage treated varied from 165 to 265 per 24 hours. The percentage of saving varied inversely as the ratio of concentration. Ultimately the best ratio of concentration was set at about 3.3: 1, which corresponded to a saving of about 55 per cent. I might add parenthetically that the guiding idea in these experiments was to determine whether or not a method could be devised by which (preferably by jigging) the tailings could be brought up cheaply to a grade which would pay to grind and concentrate on tables and vanners.

(2) The whole tailings were screened on a four-mesh screen, the oversize passing to the bull jig as before and the undersize to Wilfley tables and vanners.

(3) The whole tailings were passed over a 12-mesh screen, the oversize passing to the bull jig and the undersize to Wilfley tables and vanners.

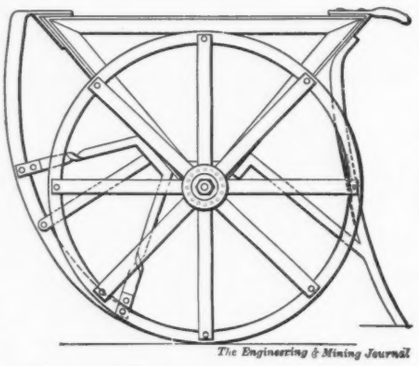
(4) In this series of tests the slime was washed out of the tailings and the residue thrown on the bull jig. The experimenters reached the conclusion that, all things considered, the treatment of the tailings as in method (1) gave the best results.

The dump was made up of four distinct kinds of material: (1) Flat scaly pieces of milky quartz containing small amounts of sulphides so disseminated that excessive grinding would be required for their liberation. This material was of about the same specific gravity as the clean quartzite which formed the major part of the tailings mass. (2) The clean quartzite, just mentioned, which frequently contained a little galena. (3) True pieces of middling which contained noteworthy amounts of sulphide with a large intermixture of spathic iron. (4) Spathic iron the separation of which from other materials containing less than 10 per cent. lead was impossible.

In order to obtain a greater recovery than named above it would have been necessary to take in a part of classes (1) and (2) which were regarded as worthless. The concentrate from the jigging operation obtained by method No. 1, containing between 3 and 5 per cent. lead, was ground in a Huntington mill to 20 mesh, this being found by experiment to be the proper size of screen. The product so made was sized on Callow screens, the oversize being fed to Wilfley tables. The final undersize passed to conical tanks and was thickened for vanner treatment.

Bunker Hill Tailings Plant

The mill for treating these tailings is shown as the North mill on the flow sheet of the Bunker Hill mill in section 2 of these articles. With the new West mill in operation, jigs will be placed in this building and it will serve the function for which it was designed. The present uses will be seen by reference to the flow sheet mentioned. The tailings will be gathered by a self-filling and self-dumping two-yard scraper on the cable of a double-drum hoisting engine. The scraper discharges on a belt conveyer, which fills the tailings-plant storage bins. The capacity of the tailings mill is expected to be 1000 tons per 24 hours. The jig concentrate will amount to about 300 tons per 24 hours and the average net profit is expected to be $0.27 per ton of tailings.



Cart for Handling Concentrates

At the time of my last visit to the district a mill was being erected by private capital near the Last Chance mill to treat the accumulation of tailings from this plant. I understand that an effort was to be made to make a shipping product by direct jigging. Beyond this statement I could obtain no information concerning the project. At the Morning mill the tailings from 9 mm. down to the limit of trommel screening are ground in three 6-ft. Huntington mills with 30-mesh screens. From this point the stream passes to a slough-off tank. The plug product from this tank passes to three duplex Callow screens and the undersize as well as the oversize goes to Wilfley tables. The dirty water from the 12 Wilfley tables treating the undersize passes to 12 Callow tanks, which thicken the pulp for twelve 6-ft. vanners. A portion of the dirty water from the oversize tables also passes into the Callow tanks.

I understand that ultimately all the jig tailings may be ground and treated as above. I cannot forbear the reflection that the regrinding of all this low-grade material is a mistake and that by jigging operations properly conducted, a noteworthy proportion of commercially worthless material might be sent to waste. The field for such a plant is not tailings but low-grade middlings.

Overcrowding Machinery

References to the evil of returning the middlings back to the machine from which they came by way of crushing machinery, elevators and screens run through many of the articles. This is one of the chief reasons why actual mill operations fall short of the expectations aroused by small-scale tests. It crowds the screens and jigs. There is bound to be an oversize return from rolls, the percentage being greater in the case of fine material than coarse. But even with the smallest return the burden of ore passing to the jigs will keep increasing until finally the rolls choke or, as most commonly happens, the jig sends the middlings over the tail board of the jig. These are the conditions existing in dozens of mills to my certain knowledge.

Millmen would gain a great deal of information of real value if they would prepare complete flow sheets of their mills. By these I mean trees showing the amount of water and the tonnage of ore and its grade flowing in every launder of the mill. They would then often find comparatively small proportions of the original stream entering the mill swollen to enormous tonnages by uncrushed and unsized middlings. I suppose it will be said in extenuation of this practice that the separate jigging of the middlings would often not yield any concentrate. In this case what is the use of returning them to the jig from which they came? If the middlings are low in grade the secondary jigging of them will often allow of noteworthy amounts of worthless material being eliminated by way of the tail board. If the middlings are of low grade and with the mineral so disseminated that light crushing will not unlock any concentrate then the proper procedure is fine grinding followed by sand and slime-concentrating machinery.

In mentioning under section 2 that the upper limit of screening was high, I gave examples of the size of opening of the holes in a number of the head trommels. The Bunker Hill and Hercules were given as 36 mm., but at these properties the oversize from the head trommel is sent to rolls, then returned to the trommel, so all the ore is crushed to a limiting size of 36 mm. At the Mammoth, 15 mm., and the Morning, 22 mm., the oversize from the head trommel passes directly to bull jigs. In these properties, then, jigging begins at the limit of the set of the No. 1 rolls, which is about 1¼ inch.

Crushing and Screening

In section 3 my argument on Blake crushers was that capacity increased with breadth of jaw rather than width of opening, and that as the ma-

jority of ores came to the mills with maximum-size pieces which would enter a crusher 9 in. wide the millman using a crusher of greater width would have paid for cast iron that did not give any service. With a crusher of greater size than 9x15 in. some form of shaking grizzly would have to be used. In the Cœur d'Alene district the crusherman rakes the ore from the bin over a gently sloping round-hole grizzly and he usually comes off shift worn out with his exertions.

In discussing trommels I indicated the line along which I believe these machines could be improved for wet screenings. Richards says in his last volumes on "Ore Dressing" that the tendency of the continental practice is away from the close sizing which has prevailed in the past. This cannot be due to a wrong principle but to poor screening. Here is a giving up of a good principle instead of attacking the difficulties which beset it. For screening coarse sizes of wet ore I have recorded my conviction that the trommel is the best device we have today. I believe the securing of a screening device immeasurably superior to it is obtainable by careful study. Such a machine could not be as simple as the trommel. Is it better to have a machine which does its work perfectly, but requires a certain modicum of attention, or to have another which does the same work imperfectly but requires no attention until it wears out? This question is squarely up to the ore-dressing world today. It means a higher standard of labor in the mills if we say "yes" to the first part of the question. In other manufacturing lines progress has come by greater refinements in the machinery used, and labor has advanced equally in skill. Possibly the preparation of mineral products is an exception to this statement!

Additional Jig Compartments

Under the head of jigging, I dealt principally with the evil of too few compartments when treating complex ores. I concluded that with the ore which I analyzed, a three-compartment jig was at least required; even a greater number than this might be necessary, the decision as to how many, in any case, being dependent on results obtained by test. I will add further that the making of a number of grades of middlings might be of decided advantage as the highest grade might for example be further treated by light crushing followed by rejigging while the others would only be amenable to treatment after fine grinding. In the new Bunker Hill mill the number of compartments of the jigs has been increased over the usual practice in the district. This is required to some extent by the departure from the usual screening practice. Many of the hutches of the fine jigs in the mills would make almost ideal feed for Wilfley tables, but instead of sending them directly to the tables they pass to the rolls, elevators and classifiers from which they came.

Colloids

Under the heading of slime settlement my argument against the colloidal theory is that with the majority of concentrating ores it is not of practical importance. The colloidal matter that does form does not seriously interfere with settlement. Some of the authorities tell us that all matter finely divided in water is in the colloidal state. Much of the experimental work on colloids has been done on material from the surface of the earth, where there has been formed by atmospheric agencies, in the decay of rocks, comparatively large amounts of colloidal matter. In these cases the colloids preëxisted and grinding merely liberated them. The more grinding the more liberation of colloids. Surface conditions are not, however, comparable to those in the unaltered deep. We would not expect to find gelatinous silica at a depth of some thousands of feet below the surface. In one breath the advocates of the theory tell us that prolonged crushing will increase the percentage of colloids while roasting will prevent the formation of colloids. If both of these statements be true they can only be so when the colloids preëxist.

Testing Plants

I will close my articles with a plea for ore testing, where the conditions will permit it, on a full-sized scale. Anyone who has read my articles closely will see that the difficulties which confront us today in mill work are more mechanical than metallurgical. If an old property decides to build a new mill, the old mill will often be the best possible testing laboratory. The practice of building small experimental mills where future operations on a large scale are contemplated is growing. The building of such a mill with full-sized machinery does not imply that the plant must be large. What is needed is a test plant equipped with a few standard machines in such a way as to allow each step to be studied separately and thoroughly. It goes without saying that each ore requires different methods.

Résumé of Previous Articles

In these closing remarks I shall briefly review the preceding chapters, stating some of the lessons to be learned from the district as I see them, and picking up some of the errors of statement into which I have inadvertently been betrayed. If anyone has gathered from my criticisms that the practice in the district is any worse than the average practice elsewhere they are in error. My aim has been to touch on milling faults which are continent-wide. I have omitted any reference to the financial results obtained in Cœur d'Alene mills; an admirable statement of this aspect of the practice will be found in J. R. Finlay's "Cost of Mining." I have also steered as clearly as I could of the question of betterments in the mills simply because this must be answered differently in each mill and by detailed work in it. I have not touched on the new Bunker Hill mill because I believe it too early to offer any comment upon it. Some of its departures from the orthodox district practice seem to me to be admirable. Unless otherwise stated all assays are fire assays.

The error of not hand sorting ore is far more general than is generally suspected. I have in mind a number of properties where the feasibility of this operation is not even suspected, and yet I am confident that the installation of properly designed picking plants would pay handsomely.

German Steel Production

The German Iron and Steel Union reports the make of steel of all kinds in Germany in 1909 at 12,049,834 metric tons. The different kinds and quantities of steel are shown in the accompanying table, in comparison with the figures for 1908. The ratio of steel to pig-iron production, which was 94.7 in 1908, decreased a little, to 93.3 in 1909, but is still higher than that of any other country.

STEEL PRODUCTION OF GERMANY.

	1908		1909	
	Tons.	PerCt.	Tons.	PerCt.
Acid converter.....	374,100	3.3	151,148	1.3
Acid open-hearth..	224,211	2.0	311,812	2.6
Total acid.....	598,311	5.3	462,960	3.9
Basic converter....	6,510,754	58.2	7,517,451	62.4
Basic open-hearth..	3,969,595	35.5	3,967,581	32.9
Total basic.....	10,480,349	93.7	11,485,032	95.3
Crucible.....	88,183	0.8	84,069	0.7
Electric.....	19,536	0.2	17,773	0.1
Total.....	11,186,379	100.0	12,049,834	100.0

Of the total reported, 63.7 per cent. in 1909 was made in the converter; 37.5 per cent. in the open-hearth furnace; and 0.8 per cent. by other methods. Direct castings, amounting to 192,883 tons in 1908 and 206,486 tons in 1909, are included in the figures. In 1909 there were 17 works making acid steel, 87 making basic steel, 24 crucible steel, and 8 electric steel. There were 30 works using converters and 74 using open-hearth furnaces.

The total increase last year was 863,455 tons, or 7.8 per cent. The gain was wholly in basic converter steel, the make of which increased 1,006,697 tons, or 15.5 per cent. Acid open-hearth steel increased 87,601 tons, or 39.1 per cent., while acid converter steel decreased 222,952 tons, or 59.6 per cent. The other classes of steel showed small losses. The basic converter remains the great steel maker of Germany.

Brier Hill Concrete Lined Shaft, Vulcan, Mich.

Seven Compartment Circular Shaft 850 ft. Deep, 14 ft. in Diameter; Total Cost Less Than $100 per ft. Steel Sets and Wooden Guides Used

BY WILLIAM KELLY*

The Brier Hill shaft was originally planned to be sunk to a depth of 850 ft., but it is expected that in the future the shaft will be sunk deeper as the conditions of the ore deposits demand. The shaft is lined throughout with concrete. Concrete was adopted for safety and permanence, to avoid the danger of fire and the expense of timber replacements. A circular section was adopted so as to use the concrete in compression and avoid the necessity for reinforcement. Even with a circular section there might be conditions of ground which would require the use of reinforcement in a shaft lining, but these conditions did not appear in this shaft, except at some points in the roofs of the stations at the different levels.

The shaft is 14 ft. in diameter and is divided into seven compartments: Cage; a six-ton skip; a ladder way; a pipe way; two balance ways, and a compartment which can be used for a small cage or other purposes as later requirements demand. The cage will be large enough for a car to carry mine timber. Fig. 1 illustrates the shaft compartments. For the conditions presented this circular section is quite as economical of space as any rectangular section would be.

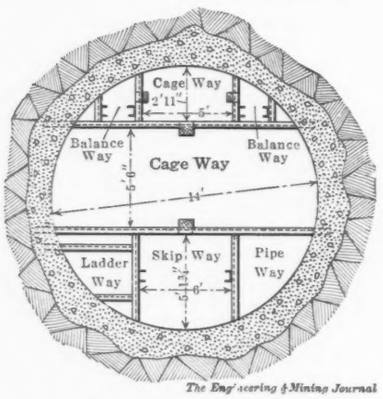


FIG. 1. PLAN OF BRIER HILL SHAFT

STEEL SETS

Steel sets have been put in 10 ft. 8 in. between centers, as shown in the plan and vertical section of the shaft, Figs. 1 and 2. The main horizontal members are composed of 8-in. channels, 13¾ lb. to the foot, placed on edge. These sets support the runners or guides of the cage, skip and balance roads, the ladders, pipes and wires and have nothing to do with bracing or reinforcing the concrete. Between the sets are studdles of steel channels to which the wooden runners for the cage are bolted. The vertical members are attached to the horizontal pieces in such a way as to allow for expansion and contraction due to changes in temperature. Ship channels are provided to guide the skip and there will be hardwood pieces attached to the skip to run in the channels. The severest strains to which these sets might be subject would arise in case the hoisting rope broke and the safety catches of the cage operated. The ladders are built of steel and the ladder way and skip compartment are to be lined with galvanized corrugated sheet steel.

PRELIMINARY OPENING ENTIRE LENGTH OF SHAFT

The shaft is to serve a territory which has been explored and partly developed by drifts from another shaft. Some stoping has been done and there are drifts at a depth of about 400, 500 and 600 ft. It was, therefore, feasible to make a preliminary opening throughout the entire length of the shaft by raising from these levels and sinking from the surface and the bottom level. This opening was made six by eight feet. The ledge is about 60 ft. below the surface, the overburden consisting of gravel and hard pan. After the preliminary opening in the upper part was completed a timbered shaft 20 ft. square was sunk to the ledge. The sets of this shaft required diagonal bracing. Excavation was then carried down for a short distance in the rock and concreting started at a depth of about 79 ft. below the surface. The concrete from this point to the surface was put in during the winter of 1908. The method of concreting proved to be a success and further work was suspended until spring when the mixing plant was amplified by the addition of a cement shed with runway from the railroad siding. A car with a cross division in it is used to measure the sand and broken rock for a charge and tram them to the hopper of the mixer. The mixer is set below the surface and a tunnel 35 ft. long connects the mixer pit with the shaft. The mixer dumps the concrete into a kibble which stands on a tram car in the tunnel. The car is trammed to the shaft and the bucket lowered. As with the preliminary opening no mucking was necessary for the upper 600 ft., it was cheaper to bring the rock from another point than to shovel and hoist the rock from the shaft. The accessibility of the material suitable for concrete was a favorable feature of the situation. The mixing plant is available also for construction of foundations for other buildings.

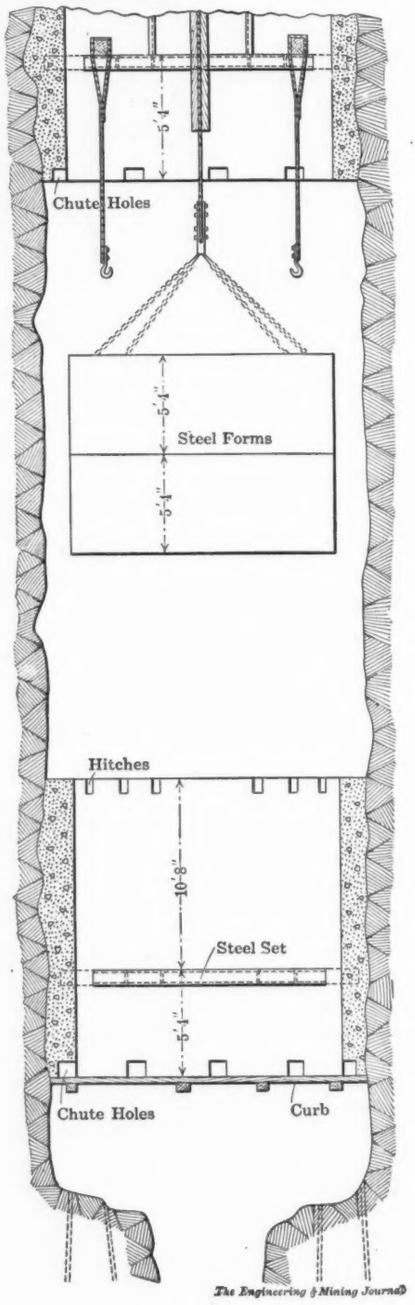


FIG. 2. SECTION SHOWING CONSTRUCTION OF BRIER HILL SHAFT

NOTE—Abstract of a paper read before the Lake Superior Mining Institute, Aug., 1909.

*Vulcan, Mich.

Concrete Mixture

It was aimed to mix the material for the concrete in the proportion of one part of cement, to three of sand and six of stone. The sand contained a varying amount of gravel and the fines in the stone varied. Tests of the voids were made by the engineers from time to time and the proportion of the ingredients in the mixture was changed to correspond.

The plans for the completed shaft in the rock called for an average concrete lining of 18 in. thickness with a minimum at any point of six inches. No attempt was made to trim the walls smooth as the irregularities of the rock are the support for the concrete. On the other hand too great irregularities in the excavations entail a waste of concrete. Measurements of the actual excavation taken by the surveyors every three feet vertically give an average thickness of the concrete of a little over 19 in. This is equivalent to a little less than three cubic yards of concrete to a vertical foot of shaft.

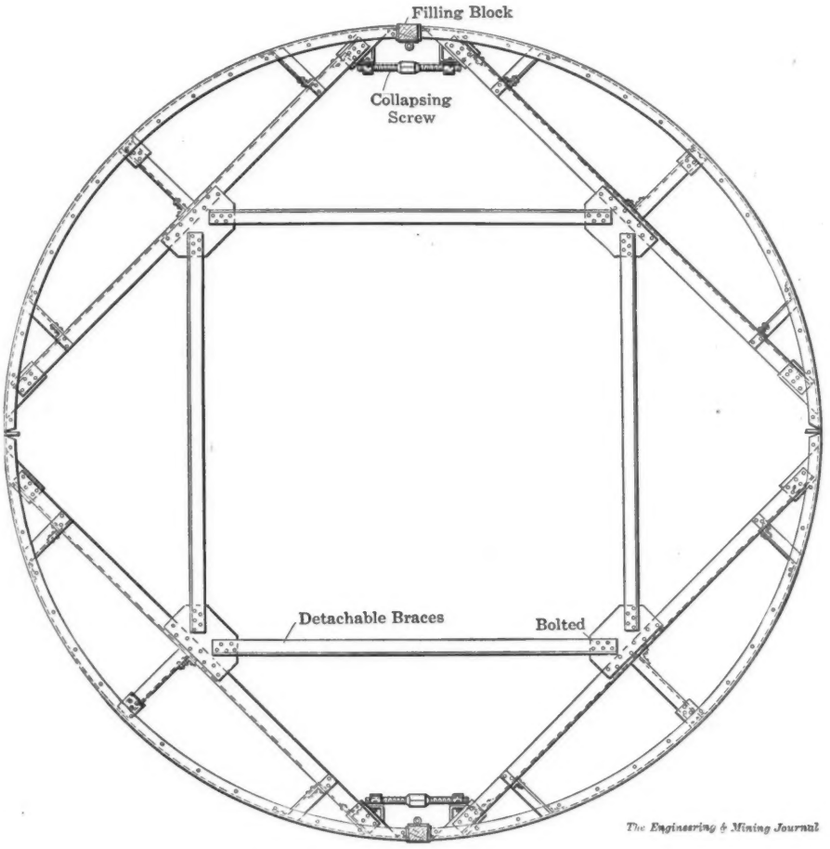


Fig. 3. Plan of Steel Forms Showing Braces in Place

Steel Forms

Steel forms were used in concreting. These are made of ⅛-in. sheet steel with appropriate bracing as illustrated in Fig. 3. Four forms are used in the circle and in two of the joints pieces of timber or "filling blocks" give space to facilitate the collapsing of the forms after the concrete is set. One round of four forms has a hight of 5 ft. 4 in. and two rounds are used. The outside of the forms is smooth and is painted with black oil each time they are used.

After the excavation of the shaft to the proper size has been carried downward for a distance sufficient to put in three or four sets of steel, a platform or "curb" is laid on the outside edge of the shaft all around near the bottom at the proper distance from the concrete above to allow for the number of sets proposed. One round of forms is then set upon this platform. Empty boxes are put in at the bottom to form "chute holes" for putting concrete into the form below at the proper time and a platform of 3-in. plank is laid over the top of the form. The concrete is then lowered in the kibble, dumped on the platform, slushed off and tamped in around the outside of the forms completely filling the space between the forms and the rock. Before the concrete is quite up to the edge of the top of the forms, boxes are put in just inside the forms to core out hitches for the steel sets. As soon as the concrete is set the forms are collapsed by taking out the vertical strips of wood or "filling blocks" in the two openings. The round of forms is attached to the hoisting rope by chains, hoisted up and suspended from the steel framework in place above.

A set of steel is then lowered, laid in the hitches left in the concrete and cemented in. The round of forms is lowered upon this new set, expanded to the proper size and the second round of forms is set up and bolted to the first so that this time concrete is deposited for a hight of 10 ft. 8 in. This can be done in an eight-hour shift, and 12 hours are sufficient for the concrete to set so that it is possible to concrete 10 ft. 8 in. of shaft and put in the steel work in less than two days. As the space between the steel sets is 10 ft. 8 in. and in starting only half this amount of concrete is put in before a set is laid, the work is joined to the older concrete above by one round of forms of 5 ft. 4 in. This is filled through the spaces or "chute holes" left by the empty boxes previously mentioned.

Cost and Rate of Construction

No attempt was made to make a record of speed. The best work was done in September and October, 1909, which resulted in the excavating (enlarging the original opening) concreting and putting in the steel of 138⅔ ft. of shaft or an average of 69⅓ ft. per month. At that time the men were working two shifts a day or 11 shifts a week of 10 hours each. Six men constituted the regular shift in the shaft either for excavating or constructing. In addition to the shaft work proper three stations have been cut out and concreted.

In keeping the record of the cost, the shaft has been divided into three parts: from surface to ledge, 62 ft.; from top of ledge to 7th level, 549.5 ft.; and from the 7th level down, ultimately, about 238.5 feet.

COST OF CONSTRUCTION.

	Surface to Ledge, 62 Ft.	Ledge to 7th level, 549.5 Ft.
Preliminary excavation...	$13.07	$18.46
Final excavation.....	18.19	15.10
Steel shaft frames.....	7.90	7.90
Steel forms.....	0.83	0.83
Temporary surface structures and equipment...	10.18	10.18
Construction	56.29	25.26
Estimated charge for compressed air.....	1.00	1.00
Total per foot.....	$107.46	$78.73
Estimated salvage on shaft timbers	0.50	0.50
Estimated salvage on temporary surface structures and equipment...	2.95	2.95
Net total per foot...	$104.01	$76.28

The item "construction" includes the handling of the steel forms, depositing concrete, and setting and erecting the steel frames. These figures include estimates of power and every charge except for general management and engineering. The cost of the first 85 ft. below the 7th level was $87.19 per foot. The cost of this circular concrete-lined shaft is about the same as a rectangular shaft of the same capacity with steel framing. The small additional cost over a rectangular shaft with timber framing is abundantly justified by the increased safety and permanence.

The Vortex Copper Converter

BY HERBERT HAAS *

From Mr. Shelby's note on copper converters in the JOURNAL of Jan. 29, 1910, it is evident that he has misinterpreted my remarks. There was no attempt at "treading on one's toes," and the statement that the air efficiency of the present copper converter is low, was not made in the spirit of a criticism, either of Mr. Shelby, or any other equally able workers in that field of metallurgy. In the development of any process or apparatus sooner or later a stage is reached where a further mechanical or metallurgical efficiency is obtained at the expense of commercial economy, and we must then move in a new direction and use other means to accomplish further economies.

AN AGE OF PROGRESS

By way of illustrating I know nothing better than the steam engine. In 1860 more than 11,000 calories were required to furnish one horsepower in a single cylinder steam engine with 35 lb. boiler pressure. By increasing the boiler pressure to 80 lb., the heat consumption of the single-cylinder steam engine was reduced to 7600 calories per horsepower in the year 1874. With the introduction of the compound engine in the same year improvements followed in rapid succession, and resulted in lowering the heat consumption to 6400 calories. Gradually the thermal efficiency was increased until only 5000 calories were required to produce a horsepower, due to increase in boiler pressure to 120 lb. A further improvement was obtained with the triple expansion engine in 1890, with the simultaneous increase in boiler pressure to 160 lb. An increase in boiler pressure above 190 lb. being limited by manufacturing difficulties the engineer turned his attention to the possibilities resulting from superheated steam, which was first tried in a single-cylinder engine. The use of superheated steam in a triple expansion engine in 1900 brought about a further reduction in the heat consumption to 3300 calories.

A further increase in temperature was prevented by the difficulties of building superheaters for such high temperatures. The development, therefore, again took a new direction, and economies resulted from the introduction of the steam turbine, to the extent of lowering the costs for buildings, maintenance, and lubrication, although the heat consumption of the first steam turbines was higher than that of piston engines, on account of operating the turbines at low pressure and temperature. By using superheated steam the heat consumption of the turbines was lowered to that of the most advanced type of piston engines. Thus from the year 1860 to 1908 the loss of heat due to imperfections in the engine was lowered from 9000 calories to 2000 calories, which is the amount between theoretical and actual heat requirements of the engine.[1]

It may be further stated, that of the total heat value of the fuel used, only from 18 to 20 per cent. of it goes toward generating power, when using the highest type of double or triple expansion engine of 3000 h.p. and over, with 185 lb. boiler pressure, 315 deg. C. superheat, and operating condensing, or using the exhaust steam in low pressure turbines (12 to 14 per cent. net thermal efficiency when deducting power used in operating boiler and condenser equipment, such as feed, water circulating, vacuum pumps, etc.). The largest modern gas engines use from 28 to 30 per cent.; alcohol motors 33, and Diesel engines 36 per cent. of the fuel value.

These statements of facts surely cannot be taken as a criticism of the wonderful progress made in the building of steam-engine and steam-power generating appliances; nor can it be considered a criticism of the copper metallurgists who have brought the Manhes-David converter to the present stage of perfection, if the statement is made that its air efficiency is low.

CONSUMPTION OF AIR IN CONVERTERS

There is, however, no reason to rest satisfied with what has been accomplished. The engineer will not stand still where there is room for further improvement, and Mr. Shelby will not deny that these were the considerations which led him to design the converter he described in the JOURNAL, just as similar considerations caused me to design one which I believe has a few valuable features. Mr. Shelby has not, as he stated in that article, tried his converter in practice, nor have I done so with mine, and though results, not promises, are the final test of any process, an engineer can, by careful analysis, make certain deductions and design machinery which in actual operation will perform the work expected of it. Mr. Shelby certainly has no doubt that his converter would be quite successful in operation. I have the same conviction about my converter, although I am quite willing to admit that some of its features are more radical than those embodied in Mr. Shelby's spherical shell converter. Before dwelling on these features, however, I shall give a few figures, "that will locate the 'low' air efficiency of the present converter."

At present the average air consumption in copper converting can be placed at 200,000 cu.ft. per ton of copper produced. To furnish this air at the required pressure, one indicated horsepower-hour is needed for 4 to 5 lb. of copper produced. This is approximately 50 per cent. efficiency, based on the theoretical combining requirements (for oxygen) of the constituents to be oxidized, and the amount of oxygen in the air actually supplied. I have official figures for one entire year of the average air consumption per ton of copper in one of the largest and most ably managed copper-smelting works in the United States, producing 10,000,000 lb. of copper monthly, so that these figures may serve as a fair basis of computation. Here they used 183,000 cu. ft. of air per ton (2000 lb.) of copper (5713 cu. m. per 1000 kg.). One indicated horsepower-hour was required to furnish this air for every 4.88 lb. copper produced, exclusive of hydraulic or electric power used to tilt converters, operate cranes, or other machinery in the converter department.

For the purpose of figuring the amount of air required, we can limit ourselves to the following average composition of matte: 45 per cent. copper, 25 per cent. sulphur and 30 per cent. iron. This represents roughly the average matte treated at most American copper works. With the exception of a few plants where pyritic smelting is practised and a large supply of marginal silicious ores are available, smelters find it cheaper to concentrate the matte in the blast-furnace rather than blow a matte low in copper to blister. As the sulphur in the above matte is somewhat higher (1 to 2 per cent.) than what is usually contained in the average matte converted, it more than compensates for omitting any of the usual impurities present in minor quantities, such as lead, arsenic, antimony, bismuth, selenium and tellurium. To bring 1000 kg. of this matte forward to blister copper we require: $\frac{250 \times 32\ (O_2)}{32\ (S)}$ = 250 kg. oxygen; $\frac{300 \times 16\ (O)}{56\ (Fe)} = (85.7)$ 86 kg. oxygen, making a total of 336 kg. oxygen, which is mixed with $\frac{336 \times 76.4}{23.5}$ = 1092 kg. nitrogen, giving a total of 1428 kg. air for 450 kg. copper, and for

*Metallurgical engineer, San Francisco, Cal.

[1]Kammerer, Entwicklungslinien der Technik, *Technik und Wirtschaft*, III, 1, 1910.

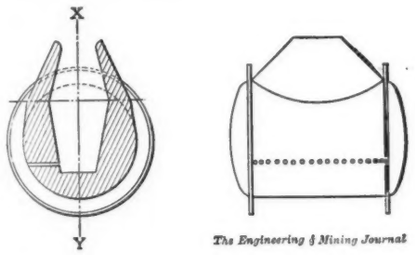
1000 kg. of copper, 3173.33 kg. air equals 100 per cent.

The 5713 cu.m. air actually used per 1000 kg. copper, with an average mean temperature of 20 deg. C., at an altitude of 5000 ft. (barometric pressure of 635 mm.), weighs, when reduced to standard conditions of temperature and pressure (0 deg. C. and 760 mm. pressure):

$$5713 \times \frac{1.2934}{1 + (0.003665 \times 20)} \times \frac{635}{760} = 5752 \text{ kg.; i.e.}$$

5752 kg. dry air were actually furnished per 1000 kg. of copper, or an efficiency of the air used of $\frac{3173}{5752} = 0.5516 = 55.16$ per cent.

This does not take into consideration any water vapor contained in the air. But as the air is dry in this particular locality, the above figures are sufficiently accurate for our purpose. A considerable portion of this air is lost in the distributing system and in punching tuyeres, so that the effect of the air actually introduced into the converter is around 70 per cent.



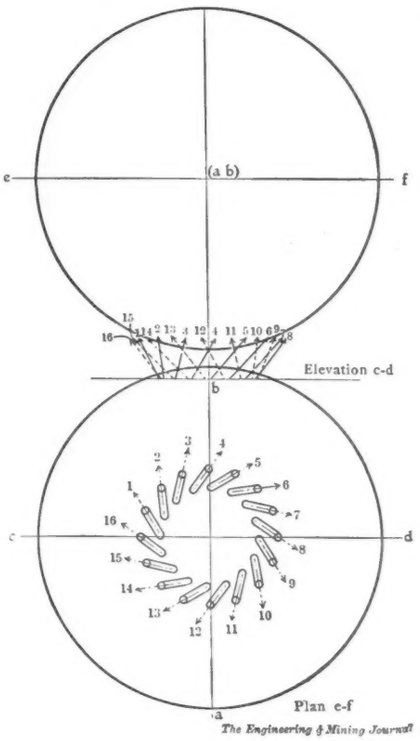
ARRANGEMENT OF TUYERES IN BARREL CONVERTER

ARRANGEMENT OF TUYERES

I give herewith a sketch of the tuyere arrangement of the converter now commonly used as well as that of my vortex converter. It will be seen that the tuyeres in the trough converter introduce the air blast in a direction normal to a plane through the line *X Y*. This direction will be maintained through the entire process of blowing, even if the converter is tilted; the air is introduced at the angle of greatest resistance, and the force of the air current is spent largely in overcoming frictional resistance, due to impact in encountering the wall of liquid matte. Aside from maintaining sufficient pressure to withstand that offered by the converter contents and to prevent the clogging of the tuyeres, the power stored up in the many air currents is used to little advantage.

It occurred to me that this power could be used to set up a rotation of the converter contents and thereby insure a more thorough mixing of the various constituents, and simultaneously a more rapid oxidation, hence shortening the time of blowing. To do this I made use of the vortex principle. I use a spherical bottom-blown converter, the circles representing cross-sections through the sphere, giving the tuyeres in plan and elevation. The converter can be tilted around the axis *ab*, thereby turning the tuyeres around the same axis. The riding rings permit a complete revolution of the converter. The tuyeres can be used also with a vertical converter.

It will be noted that each tuyere has three distinct angle functions, their direction being forward, outward, and upward. These directions are the same for every tuyere, and follow the line of least resistance, thereby imparting momentum to the mass, uniform in magnitude and direction. This would tend to rotate the mass, giving it a swashing motion, by which the converter lining would be evenly corroded. It would also eliminate the necessity of punching the tuyeres. I had frequent occasion to observe long noses extending from tuyeres in the present form of converter which can be traced to the chilling effect of the air. In the vortex converter the contents, moving constantly over the tuyeres, with the attendant rapid oxidation, prevent the forming of noses.



ARRANGEMENT OF TUYERES IN VORTEX CONVERTER

A criticism that is likely to be made by converter men, is that the copper will chill in a bottom-blown converter. Matte has, however, been successfully brought to blister copper in an upright bottom-blown converter, 13 ft. high, 7 ft. in diameter, with sixteen ¾-in. tuyeres, at Great Falls, Mont., the only difficulty having been the floating up of the bottom, and the critical periods in blowing were less easily noticed. Experience has shown that the charge is more quickly blown and that the wear on the lining is more even, bearing out the points I had in view when designing my vortex converter. The tendency with side-blown converters also has been to place the tuyeres lower. The first failures in attempting to blow white metal to blister copper likely were due to the small converters used, the correspondingly smaller mass chilling more quickly than charges of several tons now being blown.

EXOTHERMIC REACTIONS

In this connection it is well to consider the reactions in the copper converter, which with one possible exception are all exothermic, i.e., heat producing. The caloric values herein used are those given by Professor Richards.[2]

(1) $\underset{-(24)}{FeS} + 3O = \underset{65.7}{FeO} + \underset{69.3}{SO_2} + 111$ calories

(2) $\underset{-(20.3)}{Cu_2S} + 3O = \underset{43.8}{Cu_2O} + \underset{69.3}{SO_2} + 92.8$ calories

This cuprous oxide, as well as any copper oxide formed, will react with sulphide of iron, and furnish additional heat:

(3) $\underset{-(43.8 + 24)}{Cu_2O} + FeS = \underset{20.3}{Cu_2S} + \underset{65.7}{FeO} + 18.2$ calories

(4) $\underset{-(37.7 + 24)}{CuO} + FeS = \underset{10.1}{CuS} + \underset{65.7}{FeO} + 14.1$ calories

(5) $\underset{-(65.7 + 180)}{FeO + SiO_2} = \underset{254.6}{FeSiO_3} + 8.9$ calories

The above reactions take place in the first stage of the process, during which there is little danger of chilling. The critical period is that of blowing the white metal to blister copper, after the slag has been skimmed off.

But here also we have a powerful exothermic reaction between the cuprous sulphide and the oxygen of the air:

(6) $\underset{-(20.3)}{Cu_2S} + 2O = 2Cu + \underset{69.3}{SO_2} + 49$ calories

The chilling of the copper during the second stage of blowing has been explained by an endothermic reaction between cuprous sulphide and cuprous oxide:

(7) $\underset{-[20.3 + 2(43.8)]}{Cu_2S + 2Cu_2O} = 6Cu + \underset{69.3}{SO_2} - 38.6$ calories

This heat absorption is, however, continuously counteracted by a corresponding heat production from the oxidation of the cuprous sulphide to cuprous oxide. We have therefore in the last stage of the process the following simultaneous reactions which are combined in 10:

(8) $Cu_2S + 2Cu_2O = 6Cu + SO_2 - 38.6$ calories

(9) $2Cu_2S + 6O = 2Cu_2O + 2SO_2 + 185.6$ calories

(10) $3Cu_2S + 2Cu_2O + 6O = 6Cu + 2Cu_2O + 3SO_2 + 147$ calories

or

(11) $3Cu_2S + 6O = 6Cu + 3SO_2 + 147$ calories

which is equal to

(12) $Cu_2S + 2O = 2Cu + SO_2 + 49$ calories

which shows the correctness of reaction 6).

[2] "Metallurgical Calculations," Vol. I.

When it is further considered that the Cu_2S, being the lightest substance, is nearest the top, then next the Cu_2O and at the bottom the copper, it is at once apparent how beneficial a thorough mixing of the converter contents would be, to insure a continuous exchange between Cu_2O and Cu_2S, thereby producing a more rapid oxidation, a higher reaction temperature, and keeping the reduced copper from chilling, which is apt to occur if the air were forced through vertical tuyeres into the reduced copper above.

It is of course permissible to tilt the vortex converter during the second stage of blowing, raising the tuyeres somewhat from the bottom position occupied in the first stage of converting. This would give it all the advantages enumerated above as well as those of the trough converter.

Miners' Liens in Alaska

SPECIAL CORRESPONDENCE

The Committee on Territories of the House of Representatives has reported a bill (H. R. 24,149) to establish a miner's labor lien law with recommendation that it pass. Section 262 of the present civil code, gives the laborer a lien upon a mine for labor or material used in the construction, development, alteration or repairs of the mine plant, but none upon what his labor produces, that is, upon the product of the mine. The committee urges that at present the miner who mines the minerals has no protection. As 90 per cent. of all labor used in working placer mines in Alaska is digging out and removing gold-bearing gravel, this large percentage of labor is without a lien to protect it.

In reporting in favor of the bill, the committee says: "It is proposed by the bill to permit the lien holder to file his lien and to foreclose it either in the district court or in the justice's court established by an act of Congress known as the 'Code of civil procedure in Alaska.' A commissioner is appointed by the district judge in each precinct in Alaska, which in practice provides one in every mining camp. The commissioner is (1) the recorder, (2) the coroner, (3) the justice of the peace, and (4) the probate judge for that precinct. His is a court of record, with a seal and a clerk, and records are kept and provided by law.

"It is proposed that these liens upon the 'dumps' may be foreclosed before justice courts, and this method, of procedure is proposed by the delegate, who presided in that territory as United States district judge for eight years, and it has the approval of the Attorney General and others familiar with the local system."

Fluorspar

According to statistics collected by F. Julius Fohs, of the Kentucky Geological Survey, the production of fluorspar in the United States in 1909 amounted to 45,801 short tons. A detailed statement of the production for 1908 and 1909 is given in the accompanying table.

The average prices of domestic fluorspar for 1909 were: Gravel, $4.74; lump, $5.94; ground, $9.99; and the average for all grades, $5.94 per ton. Barrelled fluorspar retailed in quantities of from 50-lb. to ton lots, as follows: Crude, $10@20, and ground from $20@32 per ton. Crude foreign fluorspar was quoted at $8.50 per long ton, ex-dock. New Mexico lump fluorspar sold at $5.25 per ton.

FLUORSPAR STATISTICS FOR 1908 AND 1909.

District.	Mined Tons.	Marketed. Gravel.	Lump.	Ground.	Total.	Value.	Stock, Dec. 31.
1908 (a)							
Colorado and Arizona (b)	745	745	.....	.....	745	$4,518	.....
Illinois (b)	33,912	21,332	6,189	4,206	31,727	172,838	3,965
Kentucky	12,010	2,840	307	3,176	6,323	48,642	12,899
Total	46,677	24,917	6,496	7,382	38,795	225,998	16,864
1909.							
Colorado and New Mexico	1,700	650	850	.....	1,500	8,840	200
Illinois	39,762	31,020	2,188	8,335	41,543	239,631	920
Kentucky	4,339	4,835	336	2,629	7,800	53,233	10,116
Total	45,801	36,505	3,374	10,964	50,843	301,704	11,236

(a) The statistics for 1908 differ slightly from those collected independently by "The Mineral Industry" which reported a production of 39,389 tons for that year. (b) Statistics of the United States Geological Survey.

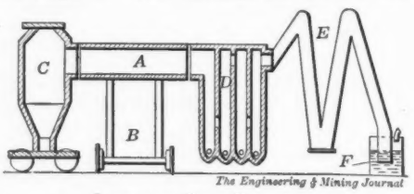
Large Scale Trenching at Cobalt

The Nipissing mines at Cobalt have now discovered a total of 132 veins on the property. Nearly all these veins have been found by trenching and Manager R. B. Watson comments on the fact that trenching is far superior to underground exploration as a means of finding new veins. He says: "It would take many years to completely trench the property and then many veins would probably be missed. The only sure way to find all outcrops is to entirely remove all the overburden on the rock surface, and preparations are now under way with this end in view." Both the La Rose and Nipissing companies are making preparations for extensive trenching operations.

Reduction of Zinc

An improved process for producing zinc or other metals, the oxidized ores of which are reduced by carbon monoxide has been patented by Oscar Loiseau, of Sclaigneaux, Belgium. (U. S. Pat. 947,831, Feb. 1, 1910.) In Mr. Loiseau's process the carbon monoxide is generated at a temperature slightly above that at which the ore is reduced, the gas being applied directly to the ore, so the heat generated in the manufacture of the gas serves to heat the ore for the purpose of reducing it.

The ore mixed with carbon is placed in a refractory chamber *A*, supported on a carriage *B*. The carriage allows the ore



LOISEAU GAS FURNACE

to be brought between the gas generator *C* and the condenser *D* which is connected to metal pipes *E*, that precipitate the last traces of zinc and conduct the carbon monoxide to the hydraulic main *F*. The latter collects the gas and keeps the entire apparatus at a fixed pressure. When the charge in chamber *A* is reduced, it is withdrawn by removing the carriage *B* and replaced by another charged with fresh ore.

The gas collected in the hydraulic main will be carbon monoxide, which only differs from that produced in the gas generator, by its lower temperature and by the presence of impurities from the treatment of the ore and the carbon.

Cape to Cairo Railway in Congo Territory

According to a Reuter despatch, locomotives are now running on the Cape to Cairo Railway to a point 40 miles beyond the Congo frontier. By the end of April it is expected that railhead will be 100 miles within Congo territory. From the Star of the Congo, or Elizabethville, the next section of the railway will be to Kambove, 110 miles to the north. Beyond Kambove it has been decided that the rails will next go to Bukana—a section of about 100 miles—situated on the navigable head waters of the Congo. When Bukana is reached there will be connection by river and road with the Atlantic at the mouth of the Congo. Through trains are now running twice weekly between Cape Town and the Victoria Falls and between Victoria Falls and Broken Hill.

Accidents in the Coal Mines of Great Britain

But Little Progress Has Been Made in the Reduction of Deaths During the Last Few Years. Suggestions and Views of Government Experts

DEATH RATE 1.324 PER 1000

In Great Britain the operations of coal mining are of considerable magnitude. That is demonstrated by home office reports, from which it may be ascertained that at the 3338 mines at work last year under the Coal Mines Regulation Act, no fewer than 987,813 persons were employed, raising 261,512,214 long tons of coal having an approximate value of $582,500,000.

In addition to coal, other minerals are raised from the pits under the Coal Mines Act. Of ironstone, last year's product was 7,890,814 long tons, oil shale from the Scottish mines amounted to 2,891,564 tons, while all the inspection districts made contributions toward the 2,814,411 tons of fireclay; the grand total of minerals produced was 275,540,746 long tons. Compared with 1907, there was a decline of 62,000,000 tons in the production of mineral and as 47,195 more persons were working at the mines, the output per person below ground was only 346 tons, while per person below and above ground it was only 278.9 tons.

More Coal-cutting Machines in Use

It is conceivable that but for the use of coal-cutting machinery, the record would have been even less favorable. There were 1659 machines in use as against 1493 in 1907. The quantity of mineral obtained by the aid of the machines being 13,590,359 compared with a total of 12,931,256 long tons in the previous year. One of the Government experts has expressed the opinion that coal-cutting machinery under the act limiting the working hours of collieries in British mines to eight a day, will prove a powerful factor in the manntenance of the coal output, and there is a tendency to accept the total output attained last year as a healthy indication of the future prospects of machinery. As regards the driving power, compressed air was employed in 922 machines, the remaining 737 machines being driven by electricity. The average output per machine works out 8142 long tons, and it is interesting to note that whereas the coal got by machine in British mines in 1902 was only about one ton in 50, last year it was one ton in 20. Looking at these figures there would seem to be some justification for the statement made by W. H. Pickering, the Yorkshire mines inspector, that the development "points to the conclusion that eventually the machine will beat the hand at the coal face, as it has already done in other mining work."

From returns voluntarily furnished by mine owners, it would appear that 23,586,132 lb. of explosives were used at the mines; 33.9 per cent. consisted of permitted explosives; gunpowder constituted 60.8 per cent. of the total weight of explosives used. The estimate is made that more than one-half pound of explosive was used for each shot fired in British mines, but the amount varied in the different districts, as evidenced by the use of 4,226,117 lb. of explosives in firing 5,514,996 shots in East Scotland; whereas only 4,508,290 lb. were used in firing 8,608,850 shots in the Newcastle district.

More Safety Lamps Used

Throughout the United Kingdom, the safety lamps in use totaled to 644,068 in 1908, or 35,716 more than in the previous year. According to the reports of the mines inspectors there is still much need for enlightment regarding the employment of safety lamps in preference to naked lights. Statistics show that Wales, Monmouthshire and Scotland though employing only about 58 per cent. of the number of men employed in England and producing only 55 per cent. of the output, had more than four times as many explosions from the use of naked lights. Last year only seven explosions were due to safety lamps, as compared with 130 caused by naked lights, and the official reports say: "So long as mines which occasionally produce firedamp are worked with naked lights, explosions of this class will continue to occur and existing rules are inadequate to prevent them. Thus in the East of Scotland out of a total of 35 explosions, 32 were due to ignitions of firedamp by naked lights."

Careful Examinations of the Roof Are Necessary

Seemingly it is an error to assume that in Great Britain the accident rate is becoming less serious. The report for the Midland inspection district, where the record is held for tonnage of coal, may reasonably be quoted. Therein Arthur H. Stokes says: "All must frankly recognize that no progress has been made in the reduction of deaths during the last few years, and that this calls for such remedial measures as scientific and practical knowledge can suggest. Many lives are lost by subsidiary causes, but when one class of accident causes more than 50 per cent. of the whole, that class should have special attention. It is upon the application of timber and a frequent and careful examination of the roof, both by sight and by rapping, that we must depend for the reduction of deaths from falls. The problem must be dealt with by well considered methods, and an attempt made by patient effort to obtain a security which men rely upon while following their daily labor."

Emanating from the pen of so high an authority as Mr. Stokes is acknowledged to be, the foregoing statement deserves the attention of all engaged in the industry. Under the British Mines Act last year, there were 1138 separate fatal accidents and two falls of ground, 563 deaths, or practically one-half are attributed. Regarding the contention that recent years have not witnessed any improvement in the death roll, statistics may be brought together for the purpose of comparison as follows:

BRITISH COAL-MINE FATALITIES.

Year.	Deaths.	Death Rate for 1000 Persons.	Deaths per 1,000,000 Tons of Mineral Raised.
1900....	1012	1.30	4.25
1901....	1101	1.36	4.76
1902....	1024	1.24	4.27
1903....	1072	1.27	4.41
1904....	1055	1.24	4.29
1905	1159	1.35	4.64
1906....	1142	1.29	4.31
1907....	1245	1.32	4.41
1908....	1308	1.32	4.75

Special reference may be made to the fire that broke out on March 4, 1908, at Hamstead colliery in South Staffordshire, owing to the ignition of a quantity of candles stored in a wooden box, resulting in the loss of 25 lives. Hugh Johnstone, the inspector in this district, says the following points suggested by the disaster claim the serious consideration of mining engineers and managers:

1. The inadvisability of having considerable quantities of inflammable materials near the top or bottom of downcast shafts. It is true that in one sense these points are not more dangerous than others, inasmuch as there are usually people in attendance there and consequently they are under fairly constant observation; but in another sense they are more dangerous, as a fire occurring in a downcast shaft must necessarily poison the air in every split and section of the mine, and render escape much more difficult.

2. The advisability of having fire extinguishing apparatus at these points in constant readiness for use. At Hamstead

there was an abundant supply of water under a head of 400 yd., conveyed in pipes down the downcast shaft and for a long distance along the main roads. It was introduced for the purpose of dealing with gob fires, to which this mine is peculiarly liable; but the possibility of fire breaking out at the shaft bottom does not appear to have occurred to anyone, consequently there were no arrangements for dealing with it. A tap had been inserted at the shaft bottom for the purpose of drawing off water for the horses, but to prevent its being tampered with by unauthorized persons it had been purposely placed at such a hight above the floor that it could not be reached without a short ladder and no other arrangements existed for drawing off water at or near this point.

3. Where the shafts are comparatively close to each other and the communication road is close to the bottom of the shafts, the advisability of having the separation doors made of incombustible materials, and the roof and sides of this road so constructed or lined with such materials that fire could not travel through it.

4. The hoisting engines to be so set that no crank is on its dead point at the lift.

5. In new sinkings, and especially where the downcast and upcast shafts are comparatively close to each other, the advisability of so arranging matters that the ventilating current could be promptly reversed if necessary. Mr. Johnstone does not suggest that in all cases of similar disaster a reversal of the air current would be expedient, or that it should ever be done without the most careful consideration of all the circumstances by those in authority. Under certain conditions it might be most disastrous, but under the conditions which obtained at Hamstead, he does not think there can be any doubt that it would have been the means of saving the mine and the lives of most, if not all, of the men.

The British reports for last year embrace the list of nonfatal accidents, compiled from the returns which colliery owners are now required to make under Section 1 of the Notice of Accidents Act. Thus for the first time, accurate figures of nonfatal accidents occurring in mines under the coal mines acts afford a reliable basis for statistical purposes. The number of persons injured was 141,851 revealing an appalling total of accidents. Commenting upon the disablements, Henry Hall, the Liverpool inspector infers that they might be very much reduced in number seeing that as matters stand, apparently one person in every five employed meets with an accident entailing more than 7 days inability to work during each year of his employment. The fact that so many of these accidents occur, in the view of Mr. Hall, "suggests either that the mines are very rough places to work in, or that there is a want of method and care in carrying on the operations."

BRITISH COAL-MINE STATISTICS.

Persons employed	987,813
Persons killed	1,308
Persons disabled more than 7 days	141,851
Death rate per 1000 employees	1,324
Deaths per 1,000,000 tons mineral produced	4.75

The above table shows at a glance the most important statistics relating to accidents last year.

Prevention of Ankylostomiasis

By C. Harpur *

The ankylostoma, or miner's worm, has been for over two years the subject of experiments at the College of Medicine, Newcastle, England, by Sir Thomas Oliver and Hermann Belger. The chief object was to find a way to prevent infection of wet and ill-ventilated mines. On January 21, 1910, Sir Oliver read a paper before the Society of Tropical Medicine. According to the statements in this paper, of the 41 disinfectants tried by Mr. Belger, the best was sulphate of iron. This costs $39 a ton. A 1 per cent. solution of it would cover 100,000 sq.yd. of floor 1 cm. deep. It would prevent the development of any eggs that might be present and kill larvæ within a day. Almost equally effective are cinders. Old cinders are better than fresh, because richer in sulphate and poorer in chlorides. Ankylostoma larvæ are often found in the grooves at the sides of main entries; these grooves should be filled with cinders. Cinders should be sprinkled round the sanitary pails, both above and below ground.

Other Disinfectants

Sea water is a third possible disinfectant; it kills larvæ within an hour. Creosote also kills larvæ quickly. Hence, where the air is moist and there is no danger of fire, the lower end of props should be creosoted to a hight of about half a yard. Ankylostoma larvæ are fond of climbing, and wooden props easily become reservoirs of them.

Managers of collieries and brickfields in cold climates are apt to think that their winter secures them from the ankylostoma, but Oliver and Belger found that larvæ frozen for six days revived and were little the worse. Tenholt found larvæ in miner's worn boots, although these had not been in the mud in which the men had been working; this suggests that the larvæ may migrate in boots from one mine to another. The interval between the infection of a man (through his mouth or skin), and the appearance of eggs in his feces, is 30 to 35 days.

*Nenthead, Alston, Cumberland, England.

A Novel System of Signaling

By Alfred Gradenwitz *

A novel pit-signaling scheme with incandescent-lamp board and checking gages has been designed by Siemens & Halske. As represented in Fig. 1, this scheme comprises five stations, that is, the winding engine, pit mouth, and three pit bottoms.

At each signaling station are installed an incandescent-lamp board *G T*, consisting of three parts, and which at the pit mouth and in connection with the winding engine, is combined with a checking gage *K Z*, as well as a trembling alarm fixed on the board case, and a single-stroke alarm *E W*. The intelligence case *V T* and the order key *A T*, respectively, are used for giving out signals. Each of the three pit bottoms further comprises an incandescent-lamp switching key *G E T*, whereas at the pit mouth is provided an additional key, the pointer back-shifting key *Z R T*.

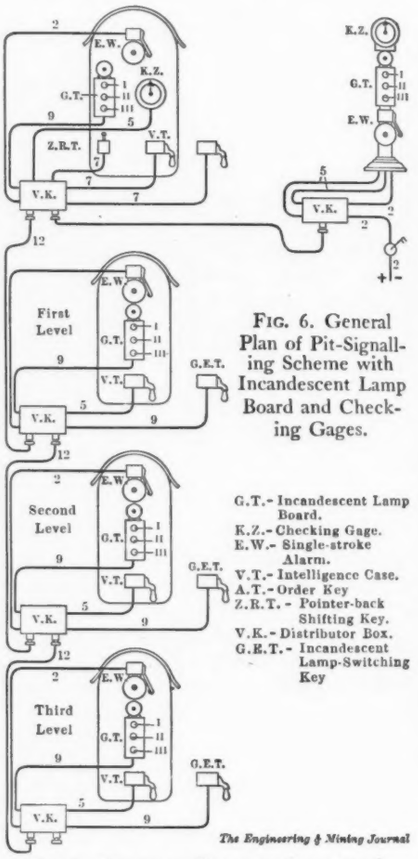


Fig. 1. General Plan of Siemens & Halske Pit-signaling System

The usual bell signals of the single-stroke alarms *E W*, actuated in connection with the intercommunication of the various pit bottoms with the pit mouth and *vice versa*, by the keys *V T*, are used for transmitting hauling signals, whereas

Fig. 6. General Plan of Pit-Signalling Scheme with Incandescent Lamp Board and Checking Gages.

*Berlin, W. 50, 3 Regensburgerstasse.

the definite signal is given by the onsetter of the pit mouth, by means of the key *A T*.

Before giving out an intelligence signal to the pit mouth, the incandescent-lamp switching key *G E T*, of the pit bottom actually worked should be pressed down, thus switching in permanently at all the posts the corresponding incandescent lamps, while the blocking of the corresponding intelligence key is relieved by special relays, and the trembling alarms are sounded for a short time at all five stations.

These bell signals as well as the lighting of the lamps serve to inform all the above, serve to block against one another the various pit bottoms, so that only the onsetter of the pit bottom marked on the board is able to give out a signal. However, any other pit bottom can put itself into circuit at any moment without any loss of time, while cutting out automatically the preceding pit bottom. The incandescent lamp boards, after commutation by means of the *G E T* key, always indicate automatically the marking of the new pit bottom. The two checking gages work as follows:

On an intelligence signal being given out to the pit bottom, the single-stroke alarms *E W* of the pit mouth, and the onsetter of the pit mouth thus is compelled to transmit to the engine the very signal he has received from the pit mouth in operation, in order to reduce its pointer to zero; that is, any mistake as to the number of the bell strokes is excluded as the onsetter has to press down the key as many times as are required for the checking gage to reach the zero of the scales. In connection with any new intelligence signal being given from the pit bottom, the pointer of the apparatus in the winding-engine room then immediately retrocedes to its position of rest, whereas that of the pit mouth again advances by jumps.

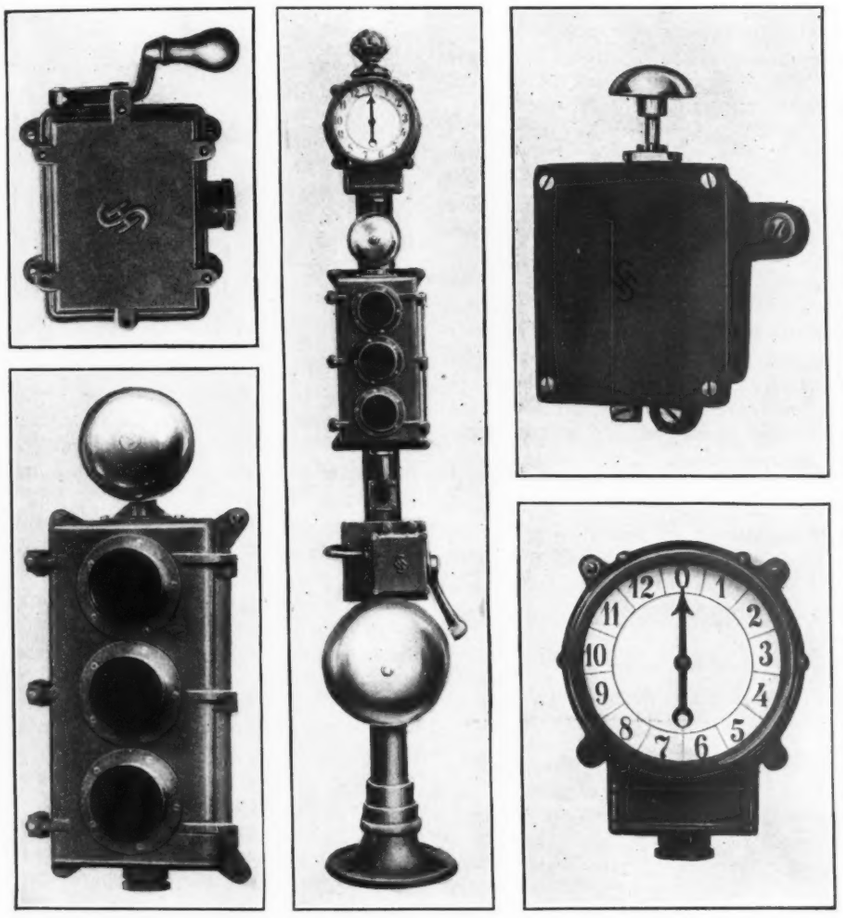


FIG. 2. DETAILS OF APPARATUS FOR PIT SIGNALING

stations that winding is performed at a given pit bottom.

The circuit of each incandescent-lamp set, corresponding to a given pit bottom, is closed by a relay located in its distributing box. This relay will remain under current after the intelligence key has retroceded, until the incandescent-lamp circuit is opened temporarily by pressing down the intelligence key of another pit bottom, thus putting out the corresponding lamps. This operation is thus performed automatically. The lamps of each circuit are connected up in series.

Special relays, in accordance with the signaling-pit bottom are sounded, while the checking gage at the pit mouth is operated. The pointer of the latter will advance through one division with each stroke of the bell, that is, with each operation of a key, and thus serves to check the acoustical signal. Whenever the stop of the pit mouth transmits the definite signal to the winding engine by actuating the key *A T*, the single-stroke alarms *E W* in the winding-engine room at the pit mouth and the pit bottom actually in operation, will be sounded, while the checking gage in the engine room advances by steps, and that of the pit mouth retrocedes, likewise by steps, to zero. The

USE OF THE BACK-SHIFTING KEY

The back-shifting key *Z R T*, located at the pit mouth, further allows the operator to reduce the pointer of both checking gages to their position of rest, without actuating the single-stroke alarms.

In addition to the signaling plant above described, there is mostly provided between the pit bottom and mouth, and between the latter and the winding engine, a communication by loud-speaking telephones. In this case there is installed at the pit mouth and each of the pit bottoms a loud-speaking telephone with lateral receivers, connected with an intercommunication key, whereas in the winding-engine room a post mounted on a pillar without lateral receivers is provided. The current for microphone operation is supplied by a battery installed at each telephone post, whereas the alarms of the various stations are connected to a common signaling-current generator.

The pit mouth then can communicate by pressing down a given key of the intercommunication switch, with each of the pit bottoms, or the winding engine and each pit bottom with the remaining pit bottoms of the pit mouth. A specially marked calling key is used for calling. The intercommunication switch of the pit mouth accordingly comprises six, and that of the pit-bottom stations, five keys.

Plants according to the above scheme have been installed at quite a number of German mines.

German Coal Miners' Wages

A German official report, based on coal mines employing a total of 335,358 persons in 1908, and 334,143 in 1909, gives the average daily wages at $1.065 for the last quarter of 1909, against $1.73 for the corresponding quarter of 1908. By classes of workers, the average daily wages in 1909 were $1.26 for miners, who formed 49.5 per cent. of the total; 93.5c. for underground laborers (27.9 per cent.); 91.5c. for surface workers (19 per cent.); and 31c. for boys, who were 3.6 per cent. of the total number. The average time worked in the quarter was 77 days.

The Mulga Mine Explosion

As the result of a terrific explosion, supposedly from a "windy" shot, 43 miners were entombed in the No. 2 mine of the Birmingham Coal and Iron Company, at Mulga, Ala., at 9 o'clock on the evening of April 20.

Immediately following the explosion, which was heard for miles around, the flames from the shaft shot up several hundred feet in the air and for a brief moment, illuminated the surrounding valley. Pieces of flying timber were thrown for a distance of a quarter of a mile.

Superintendent Johns at once telephoned the news of the disaster to the Wylam mine of the Tennessee Coal, Iron and Railroad Company, and a force of rescuers, recently equipped and drilled by Drs. McDonald and Rountree, of the Tennessee Company, were gotten together. The band of rescuers were put aboard the special hospital car of the Tennessee Coal and Iron Company, and with their equipment, were rushed to the scene of the disaster.

At 4 o'clock the following morning, the rescuers had cleared the shaft sufficiently for the men to enter the mine. Superintendent Johns, with a selected party of rescuers, descended in the cage to the first level. At this point their path was blocked by masses of wreckage, besides encountering much smoke and firedamp. One by one the men on this first rescue party were overcome by the gases and were hoisted to the surface. Other miners quickly took the place of those brought out, and the men worked in relays of 20 min. each. The oxygen helmets were brought into use at 10 o'clock on the morning of April 21, and with these safety devices, the miners were enabled to stay underground for longer intervals. The helmets used were equipped for a stay of 120 min. in a poisonous atmosphere.

The main body of miners, consisting of 13 white men and 30 negroes, were on the lower level and at least one-half of a mile from the main shaft. At 7 o'clock in the evening, 196 miners, a majority of them colored, came out from their daily work as the smaller number of men were just going in. Had the explosion occurred before 7 o'clock, the accident would probably have been the worst horror ever occurring in an Alabama coal mine.

The mine officials went about their business with calmness and despatch, and the work of rescue was well organized. It was soon apparent to the rescuers that before they could penetrate far into the mine a vast amount of wreckage would have to be removed. This task of removing débris was undertaken immediately and was carried on with great rapidity.

Many Bodies Recovered

On the morning of the second day following the explosion, 36 bodies had been taken from the mine. Twelve of the men recovered were white men, while the remaining dead were negroes. At the point where the bodies were recovered, the entries showed the terrible force of the explosion, great rocks being blown down and timbers shattered.

The latest advices state that the death list will run over 38. The officials say that the bodies of the two Italian laborers will be the last which will be found, as the mine has been almost completely explored. The mine is in poor shape for working in the immediate future. The timbers underground will have to be almost entirely replaced and a large amount of bratticing must be done before the pit can be worked again.

The Mulga property is supposed to have been a model mine. Many of the miners who worked underground stated after the explosion, that they had never entered a coal mine where the chances for dust and gas explosions were more remote. These men also stated that the air was so fresh and the current so strong that it was positively cold in the mine.

It is a strange coincidence that during recent years, our worst coal-mine explosions have occurred in properties that have been considered the best examples of modern coal-mining practice. The Monongah mine in West Virginia, and the Marianna mine in Pennsylvania were both considered as examples of the best practice in their respective districts. Still, these mines were visited by terrible explosions, causing the loss of several hundred lives.

Clifford Wins Mine Fan Suit

The prolonged patent litigation by William Clifford, of Jeannette, Penn., against George M. Capell, of England, has come to an end by the surrender of Capell. The United States Patent Office has pronounced Mr. Clifford to be the real inventor. In foreign countries, England in particular, Mr. Clifford has been forestalled by Capell, who holds the invention in Great Britain by virtue of being the first importer into that country.

On April 19, 1906, an agent of Capell is alleged to have surreptitiously entered the Clifford shops at Jeannette, the workmen supposing him to be a machinery inspector, and saw the new fans built and building. On May 2, 1906, Capell took out a patent in England for this fan under the statute of monopoly, which is the foundation of British patent law.

It is said that within one year 667 square miles of timber land have been stripped and put into the coal mines of the United States.

COLLIERY NOTES

Many practical miners claim that less damage is done to coal, when permitted explosives are employed, by using cartridges of considerably smaller diameter than shot holes, thus allowing a portion of the initial explosive energy to be lost by expansion.

The French committee on explosives, after conducting experiments with sand and clay for use in tamping shot holes, leaned toward the conclusion that sand gave better results in practice. It is stated that blown-out shots are not so likely to occur with sand as when clay is used.

In firing shots underground, the firing line must always be payed out from the shot hole to the place of safety, where the exploder (unless it is a belt or pocket battery) has been previously deposited. If the shot firer has occasion to leave the firing line, even momentarily, after having payed it out, he must take the exploder with him.

The largest producing coal mine in Alaska at the present time is in Seward Peninsula, on Chicago creek, in the Fairhaven district, 360 miles north of Nome. The mine is worked only in the winter and supplies the Candle Creek Placer mine, in the development of which it has been an important factor since the opening of the mine in 1902.

It is reported from Shenandoah, Penn., that on March 30 all records for speedy hoisting were broken at the Maple Hill colliery. The shaft at this mine is 800 ft. deep and the engines used are of the first-motion type. The record made was an average of two cars hoisted in 47 sec.; this average continued for an hour, according to officials who held a watch.

Recent accidents have disproved the common idea that electrically ignited shots cannot hang fire. Practically all mine laws provide that no person shall be allowed to go near a misfire shot until after the lapse of a certain specified interval of time. In practically all cases, an electrical misfire is exempted from such regulation. Recent investigations have proved that hang-fire or retarded ignition, when electric firing is employed, may occur in the electric detonator or in the explosive. A damp detonator might readily hang fire. The retardation may be caused by increased resistance in the circuit through broken wires, bad joints, grease or dirt on spring contacts and terminals, permitting the passage of only just sufficient electrical energy to warm the fuse bridge. The latter has then to be kept heated during several seconds. It is also true that delayed ignition may be caused by defects in the fuse, such as badly mixed, damp or insufficient priming, or by a wet charge.

MINING AND METALLURGICAL PATENTS

A CLASSIFIED LIST OF NEW INVENTIONS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

COAL AND COKE

COKE—Apparatus for Watering Coke in Coke Ovens. William L. Affelder and Mark Gorton, Brownfield, Penn. (U. S. No. 954,241; April 5, 1910.)

COKE—Leveler for Coke Ovens. Alexander E. Brown, Cleveland, Ohio, assignor to Brown Hoisting Machinery Co., Cleveland, Ohio. (U. S. No. 952,558; March 22, 1910.)

COKE—Process of Coking Coal. Samuel B. Sheldon, Buffalo, N. Y. (U. S. No. 953,351; March 29, 1910.)

COKING PROCESS. Leland L. Summers, Chicago, Ill., assignor to Continuous Process Coke Co., Chicago, Ill. (U. S. No. 951,786; March 8, 1910.)

CONVEYERS—Improvements in and Relating to Coal Conveyers for Mines. David M. Ritchie, Prestwich, Eng. (Brit. No. 9817 of 1909.)

MACHINE MINING—Improvements in and Connected with Machines for Use in Mining Minerals Particularly Adapted for Use in Mining Coal and the Like. Mavor & Coulson, Ltd., Samuel M. Mavor and Henry A. Mavor, Glasgow, Scotland. (Brit. No. 6051 of 1909.)

RESPIRATION APPARATUS for Use in Coal Mines and Other Places. William E. Garforth, Normanton, England. (U. S. No. 953,462; March 29, 1910.)

SAFETY LAMPS—Improvements in or Applicable to Miners' Safety Lamps. Joseph Prestwich, Eccles, Lancaster. (Brit. No. 12,751 of 1909.)

SCREENING — Coal-screening Apparatus. Alexander W. Crawford, Girard, Ill. (U. S. No. 954,935; April 12, 1910.)

WASHING—Improvements in Apparatus for the Washing of Coal and Other Minerals. John Shaw, Kirby Moorside, Yorks, England. (Brit. No. 16,056 of 1909.)

COPPER

BRIQUETTING CONCENTRATES — Improvements in Agglomerating or Briquetting Copper Ore Concentrates Preparatory for Smelting. Thomas Rouse, London, England. (Brit. No. 4914 of 1909.)

HYDROMETALLURGY—Improved Method of Separating Copper and Other Metals from Liquors Containing the Same Obtained in Wet Metallurgical Processes. John H. Thwaites and Stephen J. Ralph, Peterborough, Eng. (Brit. No. 4167 of 1909.)

GOLD AND SILVER

DRY GOLD WASHER. George W. Palmer, Redlands, Cal. (U. S. No. 954,580; April 12, 1910.)

FILTERING—An Improved Apparatus for Filtering and Washing Ores and the Like. Albert Grothe and Herbert F. Carter, Mexico City, Mexico. (Brit. No. 18,060 of 1909.)

PULP AGITATOR. Robert W. Gordon, Denver, Colo., assignor to Stearns-Roger Manufacturing Co., Denver, Colo. (U. S. No. 954,511; April 12, 1910.)

SLIMES TREATMENT—Extracting Gold and Silver from Ore Slimes. Andrew F. Crosse, Johannesburg, Transvaal. (U. S. No. 951,940; Mar. 15, 1910.)

IRON AND STEEL

CHARGING BLAST FURNACES—Method of Charging Blast Furnaces. Thomas McDonald and Jacob C. Barrett, Youngstown, Ohio. (U. S. No. 951,144; March 8, 1910.)

CONCENTRATION—Method of Concentrating Oolitic Ironstone and Similar Iron Ores. Gustaf Grondal, Djursholm, Sweden. (Brit. No. 18,826 of 1909.)

DRY-AIR BLAST—Apparatus for Extracting Moisture from Air for Blast-Furnaces and Converters. James Gayley, New York, N. Y. (U. S. No. 953,525; March 29, 1910.)

MANGANESE AND CHROMIUM ORES—Improvements in or Relating to the Treatment of Manganese and Chromium Ores Containing Iron. Marcus Ruthenburg, London, England. (Brit. No. 6529 of 1909.)

MANGANESE STEEL—Process of Making Manganese Steel. Henry M. Howe, Bedford, N. Y., assignor to Taylor Iron and Steel Co., High Bridge, N. J. (U. S. No. 954,188; April 5, 1910.)

REDUCTION OF IRON ORE—Improved Process for Reducing Iron or Other Ores and Refining the Metal Obtained. James J. Reed, Newark, N. J. (Brit. No. 6821 of 1909.)

STEEL ALLOY, Containing Manganese, Nickel, Chromium, Vanadium and Copper. Samuel S. Wales, Munhall, Penn., assignor to the Carnegie Steel Co., Pittsburg, Penn., a Corporation of New Jersey. (U. S. Nos. 952,391 and 952,392; Mar. 15, 1910.)

LEAD, ZINC AND OTHER METALS

ALUMINUM — Electric-Furnace Product and Method of Making Same. George N. Jeppson, Worcester, Mass., and Lewis E. Saunders, Niagara Falls, N. Y., assignors to Norton Co., Worcester, Mass. (U. S. No. 954,808; April 12, 1910.)

ANTIMONY—Apparatus for Treating Antimony Ores. Henri L. Herrenschmidt, Paris, France. (U. S. No. 953,142; March 29, 1910.)

LEAD AND ZINC—An Improved Method of Recovering Lead and Zinc from Compounds Containing Those Metals. H. W. Hemingway, London, England. (Brit. No. 4471 of 1909.)

NONMETALLIC MINERALS

ARSENIC—Treating Arsenide Ores. Frederic P. Dewey, Washington, D. C., assignor to Dewey Ore Reduction Corporation, of Virginia. (U. S. Nos. 954,263 and 954,264; April 5, 1910.)

PHOSPHATE MILL. William F. Duncker, Washington Boro, Penn. (U. S. No. 951,368; March 8, 1910.)

MINING—GENERAL

DRILL—Mining Drill. George W. Nixon, Chattanooga, Tenn., assignor to Nixon Mining Drill Co., Inc., Chattanooga, Tenn. (U. S. Nos. 953,855 and 953,969; April 5, 1910.)

MINER'S CANDLESTICK. John J. Cluin, Chicago, Ill. (U. S. No. 951,595; March 8, 1910.)

MINER'S LAMP. Robert Seippel, Bochum, Germany. (U. S. No. 953,491; March 29, 1910.)

PROPS—Improved Method of and Means for Propping Mines. Wilhelm Reinhard, Krefeld-on-the-Rhine, Germany. (Brit. No. 20,472 of 1909.)

SHAFT SINKING—Improvements Relating to Shaft Sinking. Internationale Bohrgesellschaft of Erklenz, Germany. (Brit. No. 28,998 of 1909.)

ORE DRESSING—GENERAL

AGITATING — Apparatus for Agitating Liquid Material. Robert S. Towne, New York, N. Y. (U. S. No. 952,222; March 15, 1910.)

AGITATING APPARATUS for the Treatment of Ores. John E. Rothwell and Randall P. Akins, Denver, Colo., assignors to Colorado Iron Works Co., Denver, Colo. (U. S. No. 951,742; Mar. 8, 1910.)

CONCENTRATION — Apparatus for Ore Concentration. Theodore J. Hoover, London, England, assignor to Minerals Separation, Limited, London, England. (U. S. No. 953,746; April 5, 1910.)

CONCENTRATION—Improvements in or Relating to Apparatus for Ore Concentration. Theodore J. Hoover, London, England. (Brit. No. 4911 of 1909.)

CONCENTRATION of Ores. Henry L. Sulman, London, England, assignor to Minerals Separation Limited, London, England. (U. S. No. 955,012; April 12, 1910.)

FILTRATION OF SLIMES—Apparatus for Recovering Values from Ore Solutions. Cyrus Robinson, Mount Vernon, N. Y. (U. S. No. 954,466; April 12, 1910.)

GRINDING MILL. Elias T. Lansdowne, Copper Cliff, Ontario, Canada, assignor to International Nickel Company, New York, N. Y. (U. S. No. 952,820; March 22, 1910.)

MAGNETIC ORE-SEPARATING APPARATUS. Quincy Bent, Lebanon, Penn. (U. S. No. 954,016; April 5, 1910.)

MAGNETIC SEPARATION of Ore. Quincy Bent, Lebanon, Penn. (U. S. No. 954,015; April 5, 1910.)

ORE SCREEN. Randall P. Akins, Denver, Colo., assignor to Colorado Iron Works Co., Denver, Colo. (U. S. No. 952,061; March 15, 1910.)

PULP EXTRACTOR. William H. Janney, Bingham Cañon, Utah. (U. S. No. 955,077; April 12, 1910.)

SEPARATION—Apparatus for Separating Solids from Liquids. Lamartine C. Trent, East Auburn, Cal. (U. S. No. 952,590; Mar. 22, 1910.)

SEPARATION—Centrifugal Separating Apparatus. Lamartine C. Trent, Auburn, Cal. (U. S. No. 952,653; March 22, 1910.)

SLIMES SEPARATION—Method of Dressing Ores. Frans H. A. Wielgolaski, Kragerö, Norway. (U. S. No. 953,309; March 29, 1910.))

STAMP MILLING—Improvements in Ore Feeders for Stamp Mills. George A. Mower, and Frederick W. R. Williams, London, England. (Brit. No. 14,400 of 1909.)

METALLURGY—GENERAL

BLAST-FURNACE SLAG CEMENT—Ore Briquetting. Wilhelm Lessing, Troisdorf, Germany. (U. S. No. 952,914; March 22, 1910.)

ELECTRIC FURNACE—Transformer Furnace. Eugen A. A. Grönwall, Axel R. Lindblad and Otto Stalhane, Ludvika, Sweden. (U. S. No. 953,030; March 29, 1910.)

ELECTRIC SMELTING FURNACE. Eugen A. A. Grönwall, Axel R. Lindblad, and Otto Stalhane, Ludvika, Sweden. (U. S. No. 953,029; March 29, 1910.)

FURNACE-CHARGING APPARATUS. Adolph C. Clark, Perth Amboy, N. J., and Frank L. Antisell, New York, N. Y. (U. S. No. 951,304; March 8, 1910.)

FURNACE-COOLING JACKET. John Lawson, Copper Cliff, Ontario, Canada, assignor to International Nickel Co., New York, N. Y. (U. S. No. 951,647; March 8, 1910.)

LIXIVIATION — Method of Lixiviating Ores. Gottfried Vervuert, Imsbach, Germany, assignor to Eugen Abresch, Neustadt-on-the-Hardt, Germany. (U. S. No. 952,484; March 22, 1910.)

RECOVERY—Improvements in or Relating to Means or Apparatus for the Recovery of the Metallic Contents of Ores and the Like. Gillmore Goodland, Wilhelm K. Ferro and William A. Thornton. (Brit. No. 1677 of 1909.)

REDUCTION—Process of Treating Ores and Metals. James H. Reid, Newark, N. J. (U. S. No. 950,116; Feb. 22, 1910.)

REDUCTION PROCESS—Process of Reducing Metallic Oxide Ores. Herbert E. T. Haultain, Toronto, Ontario, Canada. (U. S. No. 950,595; March 1, 1910.)

RETORT FURNACE. Nat H. Freeman, Boulder, Colo. (U. S. No. 949,178; Feb. 15, 1910.)

SINTERING—Apparatus for Treating Ores. Walter G. Perkins, London, England, and Mark L. Requa, San Francisco, Cal., assignors to Perkins Sintering Co., San Francisco, Cal. (U. S. No. 951,199; March 8, 1910.)

SINTERING—Process of and Apparatus for Treating Ores. Walter G. Perkins, Smelter, Nev., and Mark L. Requa, San Francisco, Cal., assignors to Perkins Sintering Co., San Francisco, Cal. (U. S. No. 951,198; March 8, 1910.)

SMELTER—Fume Arrester. Claude C. Whitmore, Butte, Mont. (U. S. No. 952,970; March 22, 1910.)

SMELTER FUMES—Smoke Condensing and Gas or Fume Absorber. Peter Marron, Butte, Mont. (U. S. No. 952,992; March 22, 1910.)

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

S. F. Shaw is at Los Angeles, California.

Edwin E. Chase has returned to Denver, Colo., from Mexico and has gone to Butte, Montana.

T. H. Trethewey, of Goderich, Ont., has gone to Prince Rupert, B. C., to make an examination of mining claims.

Arthur W. Jenks has been examining a copper deposit in Ontario, Canada, and will return to Berkeley, Cal., early in May.

Henry Long has been appointed general manager and J. E. Anderson superintendent of the Mammoth Vein Coal Company, at Everist, Iowa.

Alexander Imhoff has been appointed superintendent of the San Juan mines of Taviche. His address is Mina San Juan, Ocotlan, Oaxaca, Mexico.

L. B. Sutton, of New York, has been appointed consulting engineer for the Esperanza Mining Company, in place of Pope Yeatman, resigned.

Harry J. Wolf, of Denver, has been appointed general manager of the Japan-Flora Mines and Tunnel Company, with office at Telluride, Colorado.

Kazaye Kibe, an engineer connected with the Ashio copper mines of Japan, recently visited the mines and works of the Nevada Consolidated company.

Duncan McVichie has been chosen general manager of the Nevada-Douglas Copper Company, in place of Walter C. Orem, who becomes managing director.

Arthur C. Cole has been appointed superintendent of reduction for the Greene-Cananea Copper Company, in place of C. F. Shelby, who resigned recently to go to Peru.

Lee Fraser has resigned his position at the Aguacate mines, Costa Rica, and has been appointed engineer of the Abangarez Goldfields, of Costa Rica, his address being at Puntarenas, Costa Rica.

Hermann A. Keller has returned to New York from a Western trip on professional business that has occupied him for the last six months. He expects to remain in New York for about a month.

Charles Taylor Law and Frank Maxwell Wichman have opened an office in the firm name of Law & Wichman, for the practice of mining engineering, at 514 Felt building, Salt Lake City, Utah.

George G. Goodale, recently with the Albany and Centennial, has been appointed chief engineer of the Elm River, Mayflower, Old Colony and Union Land companies in the Lake Superior region.

R. B. Lamb, of the C. L. Constant Company, New York, has retired from that organization to become associated with the Proprietary Mines Company of America, offices at 15 Broad street, New York.

Jules Labarthe, recently smelter manager of the Consolidated Mining and Smelting Company, of Canada, has been appointed general manager of the Mason Valley Mines Company at Mason Valley, Nevada.

George A. Packard, having undertaken the management of property at Butte, Mont., will for the present make his headquarters there. He will continue consulting work and retain his office at 50 Congress street, Boston, Mass.

Joseph Gallup, formerly superintendent of the open-hearth department of the Worth Brothers Company, Coatesville, Penn., has accepted the position of general superintendent of the Ontario Iron and Steel Company, Welland, Ontario.

H. Boholm, director of the Tromsösund ironfields, Roktdalen zinc and lead ore deposits and Mok and Gulstad copper mines, Trondhjem, Norway, and Alex. Christiansen, mining engineer, Christiania, Norway, are in the United States.

Parish J. MacDonald, who for years has had charge of the cyanide plant of the Guanajuato Mining and Milling Company, has accepted the management of the Zacatecas Mining and Metallurgical Company at Zacatecas, Mexico, and is now in charge.

William E. Renshaw, of Idaho Springs, Colo., has been appointed general manager of the Specie Payment mine, on Bellevue mountain, succeeding A. M. Welles, who has been in charge for the last seven years. Mr. Welles retires in order that he may devote more time to his professional work.

Weed & Probert are examining the Shattuck-Arizona mine at Bisbee, Ariz., preparatory to the listing of the stock on the Boston Stock Exchange. Walter Harvey Weed has just finished an examination of the Wolverine-Arizona and has left Bisbee for Kingman for a brief examination of a mine there.

Daniel W. Talcott, Jr., has been elected general manager of the Burden Iron Company, Troy, N. Y., to succeed the late John L. Arts. William E. Millhouse has been chosen as assistant manager, to succeed the late Nicholas J. Gable. Both of the new officers have been in the employ of the Burden Iron Company for over 30 years.

Col. George F. Huff, for over 10 years past representative in Congress from the Westmoreland district of Pennsylvania, has announced that he will not accept a renomination. Colonel Huff was formerly a coal operator, and in the present and preceding congresses has been chairman of the Committee on Mines and Mining.

OBITUARY

P. C. Brady died at Virginia City, Nev., April 25, aged 85 years. He was one of the pioneers of the Comstock, and had been connected at different times with nearly all the prominent mines on the lode.

SOCIETIES and TECHNICAL SCHOOLS

State University of Kentucky—The new building for the College of Mining Engineering was formally dedicated April 21, when a number of speeches were made and the building was inspected by a number of visitors. The building has been under construction for some time, under the direction of Prof. J. Norwood, dean of the faculty.

Mining and Metallurgical Club—At a recent meeting in London this club was organized as a result of the work of a committee appointed about a year ago. The object is to provide a social meeting place in London for members of the mining and metallurgical professions. The club will start with about 500 members. Premises have been secured. S. H. Farrar is president; W. McDermott, vice-president; C. McDermid, secretary.

Kingston School of Mining—On April 27, the foundation stone of the new chemistry building of the School of Mining in connection with Queen's University, Kingston, Ont., was laid by Sir James Whitney, Premier of Ontario, in presence of a large gathering. The sum of $100,000 was granted by the Ontario government for the erection of the building. The Kingston School of Mining has now 36 professors and 320 students.

International Electro-Technical Commission—A Canadian branch of this body has been formed at Montreal, of which Prof. L. A. Herdt, head of the electrical engineering department, McGill University, was elected chairman. Other members are Dr. H. T. Barnes, McGill University; Prof. T. T. Rosebrugh, Toronto University; Prof. L. W. Gill, Queens University, Kingston; O. Higman, Electrical Standards laboratory, Ottawa; John Murphy, Ottawa; W. A. Duff and A. B. Lambe, Winnipeg.

American Society for Testing Materials—The thirteenth annual meeting will be held at the Hotel Traymore, Atlantic City, June 28 to July 2. Members have been invited to coöperate with the executive committee in its endeavor to make the program for the approaching meeting the best in the history of the society. Inasmuch as the present dues of $5 per annum are insufficient to meet financial requirements, it has been suggested to increase the dues to $10 per year. The society now has 1266 members.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

May 2—In the White River district, Kern and Tulare counties, many quartz claims have been located and some work done from year to year. Disappointed at the apathy of the miners in making productive mines from these prospects, a number of farmers of the region requested the U. S. land office to send an inspector with a view of restoring to homestead entry certain lands now classified as mineral. J. F. Burkhart, special agent for the Department of Commerce and Labor, reported that there are 27 mines there, but made no statement as to their value. Mr. Burkhart was also at Hot Springs, but found few mineral claims there worth reporting to the department.

A revival of mining is anticipated in Mono county from the installation of a water-power plant at Jordan, near Mono lake. In this general field are the Crystal Lake gold mine, the Bodie mines, the old camp of the Aurora and the Lucky Boy silver-lead mine near Hawthorne. It is stated that the mines at Aurora will be reopened. This camp produced about $16,000,000 in the '60s, and then was quickly abandoned. This is said to have been due to the heavy water flows encountered. The Detroit copper mine, near Jordan, is another abandoned property. At one time there was a small smeltery in operation here and ingot copper to the value of about $60,000 was produced. The rich silver-lead Lucky Boy mine, near the road to Bodie, although in the State of Nevada, has drawn attention to this field. In recent years the only mines of consequence that have been in successful operation are the Standard mine at Bodie and the Crystal Lake (formerly the May Lundy) near Lundy.

Denver

May 2—The affairs of the Ferris-Haggarty mine are about to be thrashed out in the courts, and charges of a sensational character are being brought out in an intervening petition filed in the Federal court at Cheyenne, Wyo., April 27. The charges are in connection with the Ferris-Haggarty copper mine, Encampment, Wyo., the Penn-Wyoming Copper Company and the United Smelters, Railway and Copper Company. Cobb, Norton and Draper, Chicago promoters, are the main parties mentioned in the action. The mine is about two miles west of Bridger Peak, and 16 miles from Encampment, to which point there is a branch railroad from the Union Pacific at Walcott. It was discovered September, 1898, by Edward Haggarty, a prospector employed by Deal & Rumsey, and these two, with a friend named Ferris, "chipped in" enough money to open up the vein and it was called the Rudefeha, composed of the two first letters of their names. The outcrop was gossan, which they sunk in for 35 ft., when rich copper ores came in, chiefly chalcopyrite and chalcocite, associated with bornite and covellite. For some time the owners shipped the ore, carrying 22 per cent. copper. The richest ores were in the upper workings, and when the owners sold out to the companies mentioned above, the latter worked to about 300 ft.

A drill dust-catcher has been patented by Thomas Gallagher, of Leadville, and a company organized to manufacture and sell it, John Cunningham, Jr., manager. A contract has been let for the manufacture of 50 of the machines.

Everyone here seems to expect a "boom" in Cripple Creek when the deep drainage tunnel shall leave the granite and enter into the main breccia area of the district, and what everyone expects is likely to happen, for these financial excitements called "booms" are largely a matter of sentiment. However, the persistence of rich ore at great depth in the big mines warrants these expectations. This will be still further aided if, as has been stated, the new Portland mill, which is expected to begin May 1, can treat $2 ore at a profit. The result is being closely watched.

Salt Lake City

May 2—The output of Utah mines during 1908 is given by Victor C. Heikes in the advance chapter from "Mineral Resources," published by the U. S. Geological Survey. The total value of the gold, silver, copper, lead and zinc produced in Utah for 1908 amounted to $23,441,280. Nearly half of this value was in copper. Utah produced 86,843,812 lb., valued at $11,463,383. Mr. Heikes shows that the ore mined in 1908 amounted to 3,658,957 short tons of an average value of $6.40 a ton. Bingham produced 68.7 per cent. of the total tonnage sent to the smelters, and 85.2 per cent. of the total concentrating ores milled. Silicious ores with their principal value in gold were produced in greatest quantity in Tooele county. Salt Lake county produced the most copper and copper-lead ores, while Summit and Wasatch counties produced the greatest quantity of lead and lead-zinc ores. Regarding the geology of the Utah ore deposits, Mr. Heikes makes an interesting classification of the percentage of ores and metals mined from three types of deposits. These are disseminated ores in monzonite porphyry or allied rocks, replacement deposits in limestone, and fissure veins. This classification has heretofore not been attempted.

An order was received by the United States Land Office April 25 restoring certain public lands in Utah to entry. Most of the lands, however, are unsurveyed, and are open only to settlement. The lands were withdrawn last October under a "temporary petroleum withdrawal order" pending an investigation by the U. S. Geological Survey as to the existence of petroleum. It was found after field investigation that these were not oil lands. The land restored includes parts of townships 32, 34, 35, 36, 40, 41, 42, 43, 44, south, in Iron, Kane, and Washington counties. A notice of the temporary withdrawal of another lot of land accompanied the list of restored lands. Those withdrawn will also be examined for petroleum. Part of these lands extend into Arizona.

The hearing in the case of the Silver King Consolidated vs. the Silver King Coalition was twice postponed during the past week, but the taking of testimony was resumed on April 18. The Coalition company requested that a joint survey be made with the engineers of the Consolidated company of places where a large discrepancy in the submitted mine maps exists. This was agreed to by the plaintiff, and an order of survey was granted by Examiner Christy. The survey is now being made.

Butte

May 2—The report of R. M. Atwater, Jr., on the North Butte property seems to be the first candid statement from a reliable source of the true condition of that property. Mr. Atwater, who is general manager of the Butte & Superior company, and upon whose opinion Duluth interests originally took up the North Butte property, states that while the Edith May vein was very rich from the 1200- to the 1800-ft. levels, the 2000-ft. level showed a marked decrease in value, while at the 2200 the vein only carried pay ore for 300 ft. as against 1000 on the 1800-ft. level. On the 2200 a pair of cross faults was encountered which form a wedge-shaped section of ground with the point upward, and within this section the ore is of high grade while outside of it the vein is barren.

A winze is now being sunk to explore this body. On the Jesse vein, good ore was also encountered between the 1200- and 1800-ft. levels, while on the 2000-ft. and 2200-ft. levels the ground has become relatively barren.

In the Emery district, Deer Lodge county, preparations are being made for operations this summer. Frank Veneer has an option on the Emery mine and mill, which, if taken up, will result in the active operation of that property. From the Blue-eyed Maggie a recent shipment of 40 tons averaging over $80 per ton, has been made. Shipments have been begun from the Emma Darling to East Helena. Placer operations in the Champion and Pioneer districts are beginning.

Ely, Nev.

April 30—The tungsten deposits in the foothills of Mt. Wheeler, southeast from Ely in the Snake range, are being developed. These veins, about 3 ft. wide are disclosed and about 100 tons of 60-per cent. ore is on the dump. E. L. Fletcher is in charge. This operation is about five miles from the old gold camp of Osceola, at which some quartz-lode mining is now being undertaken. A Scranton, Penn., company has control of the tungsten deposits at Round Mountain and is planning to undertake large operations.

Engineers supposed to be in the interest of the United States Smelting, Refining and Mining Company, have been making preliminary surveys from Ely down the Steptoe valley to the Ward district. The engineers of this company have returned from the Western Utah Copper Company in Deep Creek, from which a large number of samples were taken with the end in view of purchasing this property. The property has been partially developed and about 130,000 tons of 5 per cent. smelting ore demonstrated.

El Paso, Texas

May 2—An oil excitement of short duration caused a stampede to the scene of the reported "gusher," 75 miles north of El Paso, and 10 miles south of Alamagordo, N. M. Nearly 5000 acres were located. It was noticeable that none of the mining engineers in El Paso, conversant with the geology of the Sacramento valley, considered it worth while to go to the "strike." Some of the men who have returned from the well failed to even detect a "smell" of oil. The entire Sacramento valley consists essentially of a tertiary clay, sand, gravel and *caliche*, about 200 ft. thick, which overlies Cretaceous and Sub-carboniferous limestone. A well 6 miles north of El Paso, bored for artesian water to 2285 ft., failed to penetrate the Quaternary and Tertiary unconsolidated material. If hydrocarbons in any form exist in the Sacramento valley, it will probably require at least 3000 ft. to reach them.

Scranton, Penn.

May 2—The largest coal-stripping operation that has ever taken place in this section is under way at Derringer, in lower Luzerne county. The tract to be stripped is so extensive that it is estimated that it will occupy 300 men six years to complete the work.

There is a persistent rumor in Lackawanna and Luzerne counties that the mines of the Delaware & Hudson Company will shut down for an indefinite time. As a matter of fact five of the larger collieries of the company have already shut down, and this has caused the present talk. The officers decline to give any reason for the closing. The collieries where work has been stopped during the last week are the Greenwood, at Minooka, employing 1700 men; the Springbrook at Moosic; the Langcliffe at Avoca; the Lafflin at Dupont; the Last Chance at Pittston. The company has mines at Wilkes-Barre, Carbondale, Scranton, Dickson City, Olyphant, Jermyn and at other points.

Juneau, Alaska

April 25—Reports received from reliable miners who have gone to the Haiditarod (Iditarod) goldfields have aroused great interest in the new district and the greatest stampede since the big rush to Fairbanks six years ago is assured. Reports are received to the effect that 40 paying claims have been located on Otter flats and that $25 pans are common.

A shift in the population of the interior of Alaska is certain to begin with the opening of navigation about the second week in May. Eight steamboats are scheduled to start from Fairbanks as soon as navigation opens, and all cargo space has been taken. Machinery for use in the new field is piling up on the docks. Freight and passenger service has been arranged on the Yukon to Haiditarod, and steamer service has been arranged for on the smaller streams.

The mining outlook in the Ketchikan district has never been so bright as at present. At the Goodro property a small force is employed. The shaft is in ore to 135 ft. New machinery has arrived. The mill on the Rogers gold property at Hollis, is running on high-grade ore. The shaft is down 200 ft. Development is being pushed at the Victory Copper Company property, under the direction of Patrick Heaney. The Alaska Industrial Company on Prince of Wales island, has been shipping steadily during the winter. A new strike is reported on the lower level. Charles A. Sulzer has charge. The Mt. Andrew shipped during the last season 50 tons per day, or over 10,500 tons, carrying 4½ per cent. copper and $1.60 gold and silver. The It Mining Company has resumed operations. This property was one of the steady producers last summer, shipping about 30 tons a day, carrying 7 per cent. copper and $4 in gold and silver per ton. H. C. Strong is manager.

The Cinnabar mine on the Kuskokwim river has been sold to Paul Denhart, of Nome, who will install reduction works.

The Alaska Northern Railway will soon commence operation over 72 miles out of its projected 200 miles of railway, running out of Seward. The construction of the remainder will be postponed until there is some definite chance of developing the Alaska coalfields.

Cobalt

May 2—There has been a marked improvement in the conditions at La Rose. At the 88-ft. level of the Lawson, an oreshoot has been opened on the Keewatin vein. The vein is 4 in. wide and will run nearly 3000 oz. This is really the first important development on this property. In the main La Rose workings several important developments are announced that will add to the reserves. Work is shortly to be resumed on the company's outside holdings.

An important deal was made a few days ago in Elk Lake, when the Hiscock property was sold for $175,000. The first payment of $20,000 has been made. The original owner also gets a 10 per cent. interest in any company that may be formed. This property is very close to the Lucky Godfrey and has rich surface showings.

The mine owners in Gowganda have petitioned the government to build a branch railroad, or if this is impossible, that the present road from Elk Lake to Gowganda be extended to some shipping point. There is practically little possibility of the railroad being built, but it is believed that the Government may make an appropriation for the construction of a summer road from Charlton to Elk Lake. The question of a summer road into Porcupine is also up before the Government.

Toronto

May 2—The new mining law introduced by the provincial Government in the Quebec legislature, has for its principal object the excepting of stone quarries and some other non-metallic deposits from the provision reserving all mining rights to the Crown in past or future grants of land. After defining "mines" and "minerals" the bill enumerates the exceptions as follows: building stone and stone used for sculpture, limestone, calcite used as flux, mill stones and grindstones, sands and gravel for building purposes (except ferruginous sand), gypsum, slate used for building purposes, firebrick, pottery, ceramic substances, marl, ochers, mineral waters, kaolin, infusorial earths, tripoli or fuller's earth. The working of quarries and the other

minerals declared to belong to the surface owner, remain subject to the provisions of the mining law respecting statistics, police, employment of women and children and the sale of liquor. The bill provides that the royalty on asbestos, when imposed, shall be levied by taking as a basis the quantity and value of the asbestos produced, deducting such of the cost of the extraction and treatment of the asbestos-bearing rock as the mining inspector may think just and reasonable.

Mexico

April 29—The Madero interests, of Monterey and Torreon, have taken over the concession for a railroad from Camacho, on the Mexican Central, to Mazapil, and will build the line. It will be financed by the Franco-Español Bank, the Zacatecas Government guaranteeing 5 per cent. on the mortgage bonds to be issued. A branch will be built to the Bonanza camp, where the American Smelters Securities Company is principally interested. The Mazapil Copper Company, the principal concern of the Mazapil district, owns and operates the Coahuila & Zacatecas Railway, extending from Concepcion del Oro to Saltillo. Construction of the new line will start before June 1.

The Torres & Prietas road, extending from Torres, on the Sonora line of the Southern Pacific to Represo, 27 km., has been transferred to the Mexican Union Railway Company, Ltd., of London, by Mrs. M. T. Seymour. It is announced that the English corporation will extend it to a connection with the Yaqui river line of the Southern Pacific.

Men behind the El Paso & Southwestern railway are reported to be financing the Arizona & Gulf road, projected to extend across the Altar district from a point near Sasabe, on the border, to Point Lobos, on the Gulf of California. The line will connect with that extending from Red Rock, on the Southern Pacific in Arizona, to Sasco where the Imperial smeltery is situated.

Southern Pacific construction is being rushed south to the Santiago river in an effort to complete the extension to the Tepic capital before the rainy season is advanced. South of the capital the line will open the Compostela district.

The Transvaal Copper Company, of Cincinnati, will build a narrow-gage road to connect its smeltery at Cumpas and its mines. Principal stockholders recently visited the properties, and as a result capital for the railroad and for further development will be available. The Southern Pacific has completed the roadbed of its Yaqui river line through the cañon south of Nacozari, and its concession calls for the building of the line as far south as Cumpas within the next few months.

The Chapala Hydroelectric and Irrigation Company, of Guadalajara, which promised power in the Hostotipaquillo and Etzatlan districts, Jalisco, by June, will be unable to make good. It will be possibly the end of the year before current can be supplied. The Chapala company entered into an agreement with the Guanajuato Power and Electric Company for a division of territory, and a clause in the agreement provides for the supplying of power by one company to the other in case of emergency. To make this exchange of power possible it will be necessary for the Chapala company to change its voltage plans, necessitating changes in equipment, and as a result the transmission of power will be delayed several months.

London

April 25—In a recent anniversary address by the president of the Mine Managers' Association of the Transvaal, the question of the advisability of publishing monthly statistics was one of the subjects discussed and the remarkable statement was made in the name of the Association and not of the president alone that the present system of working the mines did not tend to the maximum profit from any given area of ground, or in other words, that the mines were not being worked to the best advantage. The explanation given was that the mine managers were instructed by the directors to produce monthly returns that did not vary, and that, in order to carry out this policy, it was necessary for them to scatter the labor force about the mine instead of concentrating them and working out the mine in regular sequence, which would result in a lower cost of working. It is a curious admission to make, and one which shareholders in the Transvaal mines will doubtless not pass unnoticed. The public are now told by an authoritative body that the profits in the mines have been sacrificed for the sake of an arbitrary policy of regular returns, and they will naturally ask what advantage there is in these so called regular returns and what harm would be done if the monthly returns did vary. Mines in other parts of the world are not worked in this way, and the publication of a poor monthly return does not create a panic. Shareholders in mines know well enough that ore deposits vary in richness and that a certain amount of fluctuation in the profits must occur. On the Rand, the large size of the mines tends to produce regular returns and even on the smaller mines, the president of the Mine Managers' Association does not anticipate a larger variation in the recovery than two pennyweights per ton. The argument that fluctuating returns will frighten or unduly elate shareholders is a weak one for proposing the abolition of monthly returns, and any attempt to withhold information will certainly meet with strong opposition from the public, as, indeed, happened when it was advocated some time ago to publish quarterly instead of monthly returns. It is interesting to notice that the argument that the cost of clerical labor involved in the preparation of monthly statistics made a change desirable is dismissed by the president as one of no weight whatever.

The charge that the president of the Mine Managers' Association brings against the financial houses is a serious one. As to what losses have occurred through this mistaken policy, no estimate is made. Perhaps it is not much, but it is a loss which ought not to be allowed to occur in the future.

On the subject of working costs, the president had also something to say. According to his view, the tonnage basis for the preparation of statistics was not satisfactory and some scheme of recording results according to the area exploited seemed to him a better way of doing things. The change proposed is so remarkable that it may be well to quote him *verbatim*, especially as these revolutionary proposals appear to be being seriously considered by the most influential mining house on the Rand.

He says: "If a system were generally adopted whereby a comparison of profit derived from areas exploited were made the basis of comparison, we would, I know, show higher cost per ton crushed, but the Rand would also, I believe, show a greater profit per area denuded of its valuable product, and that, I feel sure, is the thing we are all, or should all, be striving for. The scheme outlined above is, I understand, being introduced into the Corner House mines at once at the suggestion of H. F. Marriott, and we may therefore hope that before long the bogy of 'cost per ton milled' will have been permanently scotched, to be replaced by the much more accurate 'square fathom exploited.' But when all is said and done as regards basis of comparison, the main thing to remember is that in no two mines, or even the same mine at different periods, are conditions really similar; and that, therefore, comparison on a cost or a profit basis is most dangerous except to those fully informed of the circumstances of both, and that the financial inclusion of two mines under one control does not of itself make comparison possible where conditions remain dissimilar."

With the concluding portion of this quotation most mining men will agree, but not so with the other proposal that areas rather than tonnage are the best unit for comparison. The tonnage basis of recording results has been from time immemorial the accepted method. It is a basis which can be well understood by the general public, and until some better reasons than those given are advanced, it is not likely that mining engineers will take kindly to such a fanciful unit as the square fathom exploited.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Arizona

GILA COUNTY

Superior & Boston—Work in the drift on the 400-ft. level has been discontinued, while two winzes are being sunk on the Black Oxide vein. Both winzes and the drift, measuring 225 ft. long, are in ore assaying 8 per cent. copper, or better. The ore at these, as at the McGaw workings farther north, is carbonate. J. D. Wanvig is superintendent.

Arizona-Michigan—The development at the Blackbird shaft has shown a 5½-ft. vein at 180 ft. Some copper carbonate is present on the hanging wall of the vein, where the vein carries iron and manganese. Crosscutting is in progress at the 100-ft. level, and a second level will be established at 200 ft. At the 500-ft. level of the Telfair shaft, the south crosscut is in shale 755 ft. southward. N. A. Nelson is superintendent.

Superior & Globe—The work in the west drift on the 650-ft. level has been temporarily discontinued while a winze is being sunk on the fault. The fault is being drifted east of the north crosscut. H. V. Snell is superintendent.

Live Oak—Five drifts are being advanced, of which four are on the 300-ft. level and one is on the 200-ft. level. The shaft is in chalcocite at 80 ft. below the third level. Sinking will be continued to the bottom of the orebody. North of the shaft a churn drill is putting down a hole, which will connect with the third level drifts.

Arizona Commercial—Owing to the fact that the ore reserves could not easily meet the demands of the smeltery, the company has shut down its smeltery, and of its former 350 employees has retained only about 70 men, who are now engaged in development to open new ore deposits. President Amster and J. Morgan Clements are now at the property. The flow of water on the seventh level is about 2,000,000 gal. daily and developments cannot be instituted on the eighth level until this flow of water diminishes greatly.

PINAL COUNTY

Sultan-Arizona—The Baldwin Syndicate of Chicago has acquired this property and will begin active development.

YAVAPAI COUNTY

George A. Treadwell—The stockholders of this company are meeting in New York to devise some plan to protect their interests.

California

AMADOR COUNTY

Bunker Hill—An oreshoot has been opened up on the 1750 level. The drift on the 1950 level is in 300 ft. A cyanide plant under charge of William E. Darrow is treating the mill tailings.

Little Amador—This mine, between Keystone and Bunker Hill, purchased about three years ago by the Original Amador Mines Company, of Oakland, W. F. Deaner, manager, has started the mill.

South Eureka—A new drift on the fifth level has entered pay ore. The vein is now opened from the fifth to the 27th level. The mine has been recently sampled by a prospective buyer.

49-Flat—This mine, near Volcano, will erect a mill.

CALAVERAS COUNTY

Carson Hill—This mine near Irvine, credited with several million dollars production and with the production of a single mass of gold valued at $75,000, is the property of the Vanderbilt family and was recently inspected by Mrs. W. K. Vanderbilt. Last fall the mine was reopened and development work has been in progress since.

ELDORADO COUNTY

Montezuma—This mine on the Mother lode north of Nashville, is being opened by the Senator Flint Exploration Company.

Adams Gulch—These claims adjoining the Montezuma are under bond to Senator W. A. Clark. A small force of men is at work arranging to drive a tunnel to strike the lode at about 500 ft. below the croppings.

Good Luck—This mine, Diamond Springs district, is under bond to Robert Mitchell, who is prospecting it.

INYO COUNTY

Tecopa—A branch railroad from the Tonopah & Tidewater is under construction to this silver-lead mine, in which much ore is developed.

SIERRA COUNTY

Oakes—This quartz mine, Sailor ravine, adjoining the Standard, has been bonded by Homer Gould.

Gold King—Daniel McDonigal has bonded this mine on Kanaka creek. It is equipped with a 15-stamp mill. The 40-ft. tunnel is being extended.

Eastern Cross—In the 300-ft. tunnel rich ore has been encountered. The property is near Kanaka creek. A. and Leon Bovee are the owners.

Oriflamme—This mine, near the Irelan group in the Alleghany district, has been purchased by the Oriflamme Mining Company.

Twenty-One—The tunnel on the vein is being extended and milling ore extracted. F. M. Phelps is manager.

Sierra Wonder—The mine has a crosscut tunnel to the vein and considerable drifting has been done on the vein.

Bear Creek—The mill installed last fall near American hill, was operated with satisfactory results. John Andrews is manager.

Slate-Castle Jaffa—At this mine high up on the south slope of the North Yuba cañon, south of Downieville, a new lower tunnel has been started. Sol. Camp is foreman.

General Sherman—This property at Alleghany is reported to be bonded to Daniel McDonigal.

Haskell Peak—A tunnel is being extended to tap the gravel channel high up on Haskell peak. Henry Goering is superintendent.

Jersey—At this mine, formerly the Slattery, west of Forest on Oregon creek, the tunnel is in 2100 ft. and a contract has been let to extend it 100 ft. farther.

Colorado

CLEAR CREEK AND GILPIN COUNTIES

War Dance—This mine, Russell gulch, has ended its litigation and the lessees will sink and open up reserves.

LAKE COUNTY—LEADVILLE

Bohn—C. E. Dickinson and others of Leadville, leasing on the Bohn, in the downtown district, are mining some unusually high-grade silver ore at 420 feet.

Silent Friend—This property, on Breece hill, has been proved to contain large bodies of smelting ore, and much was shipped, but ultimately being of low grade, it would not pay with the increased cost of pumping and hoisting. Now, however, it is to be operated through the Yak tunnel, and will be operated on a large scale, with William Doran, manager.

Big Four—The Crawford Mining Company, of Chicago and Boston, has secured control of this mine, Breece hill, and will start work. The old levels will be exploited and the shaft, which is 780 ft. deep, will be sunk to 1000 ft. Isaac N. Jones is manager.

SAN JUAN DISTRICT

Camp Bird—The March proceeds were $190,289 and the net profit £28,317. The final payment to the late Thomas F. Walsh was made March 25.

TELLER COUNTY—CRIPPLE CREEK

Rubie—In this mine, Bull hill, high-grade gray copper has come in at the 1500 level, where a discovery of rich ore was lately made. The same ore was found at about the same level in the Blue Bird mine, nearby. The streak is about 2 in. thick and selected specimens carry 1000 oz. silver to the ton.

Granite—This mine, C. C. Hamlin, manager, operated entirely under the leasing system, during 1909 shipped 19,191 tons of gold ore, which averaged $22.15 per ton, from which the company received royalties of $97,406.

Monitor and Proper—Vetter & Co., and Reed & Co., lessees on these mines, on Globe hill, have opened a large deposit of surface ore, which it is estimated will ship at about 1½ oz. gold per ton.

Dante No. 2—M. B. Rapp, leasing, is shipping 400 tons per month of high-grade ore.

Thomas Fraction—Bodfish & Terry, lessees on this mine, have discovered a vein in the workings through the Victor tunnel from which they are shipping ounce ore.

Trilby—Superintendent Syer is shipping milling ore which is giving returns of $17 per ton in car lots.

Idaho

CŒUR D'ALENE DISTRICT

Stewart—This company has leased from the Federal company the Mammoth mill and is shipping. M. W. Bocar is in charge.

Black Bear—The company will erect a mill soon.

Indiana

VANDERBURG COUNTY

Winifred Mining Company—This Evansville company has been adjudged bankrupt. The indebtedness consists of a bond issue of $20,000.

VERMILION COUNTY

Benjamin R. Whitcomb has bought the coal and mineral rights under 1500 acres adjoining a tract of 194 acres already owned by him west of Clinton.

Michigan

COPPER

Keweenaw—The drill 1000 ft. from the new shaft, in the hanging-wall side, has reached the Kearsarge lode at 925 ft. The core shows the lode to be about 22 ft. wide and well charged with copper throughout. The shaft sinking on this lode is down 170 ft. in the hanging-wall. This company is operating a drill at the bottom of its Medora shaft, driving in the direction of the Calumet conglomerate lode.

Phœnix—This company, controlled by the Keweenaw Copper Company, has let a contract for drill work, particular attention being given the Ashbed lode, which was worked in the early days and from which a large amount of copper was extracted. The last work done on this lode was 10 years ago.

Ahmeek—The two new shafts, Nos. 3 and 4, are down 750 ft. each. These shafts are sinking at an angle of 80 degrees and start with a common collar at surface and diverge with depth. These shafts will command the northern and central portions of the land and should reach the Kearsarge lode at 1250 ft. No. 1 shaft is down to the 14th level and No. 2 to the 15th. Rock shipments averaging 1700 tons daily are being made to the Franklin and Tamarack mills. The stamp mill will be ready June 1.

Oneco—No. 6 drill hole is down 1675 ft. and has encountered an amygdaloid lode carrying a small amount of copper. No. 7 hole is down the same depth. These holes will soon be discontinued and the drifts moved to the eastern portion of the tract. They will go down vertically to cut the New Baltic lode, as exposed on the New Baltic.

Lake Superior—This development company has its drill in the lode after passing through 100 ft. of overburden. Explorations on this tract are being carried on in virgin ground.

Lake—This shaft is down to the seventh level. The crosscut from the sixth level has recently entered a rich run. Operations at the other parts of the mine continue with the same good results. More drills will be started.

ST. CLAIRE COUNTY

Port Huron Salt Company—The company will sink a deep shaft to mine rock salt. Otto Huette is manager and Charles A. Harkin, engineer.

Missouri

Boston Mining Company—This company, capital $250,000, has been listed on the Boston Curb. It is building a 600-ton mill in the Joplin district and will mine by steam shovel. Franklin Playter is manager.

Montana

BUTTE DISTRICT

Raven—On the 200- and 300-ft. levels sets of leasers are at work. The crosscut on the 1500-ft. level is in about 200 ft. and is expected to reach the vein in a short distance.

Butte & Ballaklava—First-class ore is being shipped exclusively at the rate of 70 tons per day. In May, shipments of second-class ore will be begun and it is expected 300 tons will be shipped daily.

Anaconda—It is believed that the next news of importance about this company will be to the effect that it has absorbed the properties at Butte of W. A. Clark. Some surprise has been expressed that in the consolidation already consummated the North Butte was not included. However, it is now quite obvious that North Butte could not have been taken in at any reasonable price that would not have raised an uproar from its stockholders who had been kept in the dark as to the real condition of that property.

BROADWATER COUNTY

Keating—The shaft is now 500 ft. and will be sunk to the 600 when crosscutting and drifting will be begun.

Black Friday—The shaft is 500 ft. and drifting is in progress at that depth.

Ohio Keating—Operations will be resumed when the electric power has been installed.

JEFFERSON COUNTY

Corbin Copper—The Dewey lead has been drifted 500 ft. and disclosed an orebody 30 ft. wide. The Bonanza tunnel has been in ore 111 ft.; the Dow tunnel is in 771 feet.

LINCOLN COUNTY

Comet Placer—The property on Cherry creek was recently equipped with a mile of pipe line, a long flume and ditch and two giants for hydraulic mining.

MADISON COUNTY

McKee—James J. Martin has succeeded R. B. McGinnis as superintendent. Work will be resumed.

Atlas—A strike has recently been made in the east vein which was intersected by a crosscut 120 ft. long.

Nevada

ESMERALDA COUNTY

C. O. D.—The Gray lease at Goldfield is shipping another car of $45 ore. The copper content being high, the ore will go to Kennett, California.

Goldfield Consolidated—Seventy stamps are dropping, handling 550 tons daily.

NYE COUNTY

Montana-Tonopah—The largest semi-monthly cleanup in the history of the company resulted in 29 bars of bullion, averaging about $800 for the first half of April.

Blue Jacket—Placer operations at Round Mountain are giving satisfactory and uniform results.

Round Mountain—Interest centers around the new shaft 1500 ft. east of the main workings. The head frame is in position and the shaft timbered to 35 feet.

WHITE PINE COUNTY

Giroux Consolidated—Concrete foundation piers are being put in for the 95-ft. steel gallows frame over the new

shaft. The battery of 8 boilers for the new hoisting plant has been delivered and the engine is on the way. The work in the new shaft consists of enlarging to full size the compartment sunk from 1000-ft. level to the 1200-ft. level. This is being done by raising the broken rock falling into a chute from which it is hoisted to the 1000-ft. level and transferred to the other cage which takes it to the surface. Progress is at the rate of 10 ft. per day, which includes putting in the shaft timbers. The shaft is making only enough water to keep a small pump busy three hours per day. The 1200-gal. pump is on the way. The pump station, 40x100 ft., has been started.

Nevada Consolidated—Work on the new steam-shovel cut will be started before July 1,, and five new shovels are en route. It appears from numerous holes drilled the last two years, that the new pit will extend from the south end of the present pit westerly 3000 ft. up to the side lines of the Butte & Ely. The surface has been cleared and a track extended around the north and west side of the hill to within a short distance of the proposed pit. One churn drill is at work on the Liberty claim at what will be the west end of the pit. The overburden there is from 35 to 70 ft. deep, and from present indications the general average will be about the same as in the old pit. Improvements in the mill have raised its capacity from 6000 tons per day to 8000 tons. This has been effected through modifications in the method of classifying the pulp, and other minor matters whereby but comparatively little expense has been involved.

Ohio

Canaan Coal Company—This company gives notice that its main office has been removed to the Athens National Bank building in Athens, Ohio.

Utah

Beaver County

Majestic—Shipments are being made from the Hoosier Boy group. The vein is 4 ft. wide and carries lead and silver with some copper. Ore is being prepared for shipment at the Harrington-Hickory.

Moscow—This company is shipping two carloads of high-grade silver-lead ore per week and arrangements are being made to increase shipments. The orebody has been developed along its strike for 300 ft., and has been followed 90 ft. or more below the 400-ft. level.

Cedar-Talisman—The orebody on the 500-ft. level is opening larger with development. In places a breast of ore 8 ft. wide is reported. Some of the ore is first class lead-silver ore of shipping grade.

Blackbird—Work on this company's holdings near Newhouse is to be resumed. Prospecting will be carried on by drills under the direction of J. R. Steele.

King David—It is reported that this property is to be closed.

Cave—W. J. Merritt, of the Red Warrior company has taken a lease on this property, and is mining iron ore which is shipped for flux. Ore is being hauled to Milford.

Juab County

Chief Consolidated—Drifting is being done on the 1600-ft. level to get under the orebody developed on the 1400. A raise will be driven to cut this ore. The shaft is at the 1800-ft. level. Holders of Eureka City Mining Company's stock have been told to notify the secretary of the Chief Consolidated before May 16 if they wish to exchange their stock for shares in the latter company. The basis of exchange is one share of Chief Consolidated for every five shares of Eureka City.

Opex—The diamond drill on the 2147-ft. level is being driven laterally and upward in search of ore and not downward, as has been reported.

Missouri Mining Company—This company was recently organized to control the property of the Montana Mining Company. Development work will be begun. John Roundy is manager.

Lower Mammoth—The drift on the 2000-ft. level is being driven along a break which shows mineralization. The drift is being driven for the contact with the expectation of developing the orebody opened above on the 1800 level.

Salt Lake County

City Rocks—This company at Alta has developed a new silver-lead fissure in the 500-ft. crosscut from its lower tunnel.

Bingham-New Haven—This company has closed its mill for repairs. The jigs will be replaced by tables and vanners.

Tooele County

Ibex—This property at Mercur closed on April 14. It is reported that the Ibex and Vindicator are to be consolidated.

Utah Metal—This company, which is driving an 11,000-ft. tunnel into Carr fork from the Tooele side, has its machinery installed and work on the tunnel will be pushed.

Virginia

The Stonega Coal and Coke Company has obtained control of the mines and coke ovens of the Keokee Consolidated Coke Company in Wise and Lee counties. This purchase gives the Stonega company control of the larger part of the developed property in the Wise county field.

Washington

Ferry County

A large custom mill for handling Republic ores is being designed and will be erected by the Hess Cyanide System Company, of Spokane.

Pacific Ore Company—This company has leased ground for a cyanide mill in West Republic. E. R. Davidson is representative.

Hercules—At this claim of the Buckskin company, E. J. Cheatham, president, development will be started.

Okanogan County

Molson—Preparations are made to start the new mill and work will be carried on extensively. J. Plomert is manager.

West Virginia

The Hope Natural Gas Company has struck one light gasser on Flint creek and another on Israel's fork, near a gasser of the Carter Oil Company. On Buckeye fork, the Luck Gas Company has a new gasser on the Heaton farm. Along Rock run, the Eastern Oil Company has found a 2,000,000-ft. gasser on the McCain farm and the Sun Oil company, a 3,000,000-ft. gasser on the place of W. J. McMillan.

In the Shinnston field the production continues to decline; few of the old wells will now yield without pumping, and all the recent wells drilled in outlying territory, with the hope of finding an extension of the pool, have been dusters or gassers. A liberal gaging would only show an output around 5000 bbl. per day for the whole pool.

On Upper Two-mile creek in Lincoln county the Jennings Oil Company has a gasser on the Solderby farm, of 2,500,000 ft. daily. On the Holderberry estate, the Pure Oil Company has a 3,000,000-ft. gasser and another of equal output has been struck on the farm of Jennie Jones, by the Hamlin company.

About 50,000 acres in Monongalia county have been leased near the Cheat river for gas and oil prospecting. It is understood that a good part of the leases will be controlled by subsidiaries of the Standard. On Dunkard creek, the South Penn company has struck a 275-bbl. oil well in the fourth sand on the Wilson Haught farm.

On the G. W. Hammer tract, along Indian run in Ritchie county, No. 2 well of the Frimier Oil Company produces 150 bbl. and the No. 4 well, 125 bbl. per day. From the Keener sand, the Fisher Oil Company has a 160-bbl. producer on the P. R. Tharp farm, while Rasel & Co. and Dollman & Co. have brought in light pumpers in the same neighborhood.

Dusters have been the luck of the Philadelphia Company on McElroy creek, Tyler county, but on Middle Island creek

the Melrose Gas and Oil Company has brought in a 50-bbl. flowing well; while Urquhart & Bailey have completed a 15-bbl. pumper on the J. W. Kyle farm. On the tract of Oliver Gorrell, the Gorrell Farm Oil Company has now a 15-bbl. pumping well.

Wisconsin

The zinc-oxide plant at Mineral Point will be enlarged at a cost of about $250,000.

Wyoming

Suit has been begun at Cheyenne by a stockholders committee alleging fraud in the affairs of the Penn-Wyoming company, and the United Smelters Railway and Copper company and subsidiary companies successively in control of the Ferris-Haggarty mine at Grand Encampment.

Canada

British Columbia

Canadian Collieries (Dunsmuir), Ltd.—This company with a capital of $20,000,000 has been chartered to take over the Dunsmuir coal mines and properties on Vancouver Island, B. C., the sale of which to the Mackenzie & Mann—the Canadian Northern—interests was announced some time since. These collieries ship a large part of their production to San Francisco.

British Columbia—The company has suspended operations owing to labor troubles.

Nova Scotia

The strike of the employees of the Dominion Coal Company belonging to the United Mine Workers, which commenced on July 6, 1909, was called off April 29, the men returning to work unconditionally. It is stated that the leading officials of the union have for some time been in favor of this course, while the local leaders opposed it. The union is now fighting against a reduction of the wages of the coal miners at Frank, Alberta, and the desire of the officials to concentrate their efforts upon this struggle is believed to have hastened the settlement of the Cape Breton strike. That strike, however, has been practically a failure, and this had been conceded for several months past.

Ontario

The shipments from Cobalt for the week ended April 22 are as follows: Nipissing, 332,745 lb.; Kerr Lake, 240,000; Crown Reserve, 200,700; La Rose, 151,900; Right-of-Way, 42,000; Trethewey, 64,000; Coniagas, 78,000; Buffalo, 58,000; O'Brien, 66,040; Chambers-Ferland, 41,950; total, 1,275,325 pounds.

E. Jones and Frank Blackburn, the two prospectors instrumental in starting the stampede into the Caribou Lake district, have been committed for trial at North Bay on charges of false pretenses and perjury.

Rochester—Another new vein 4 in. wide, and carrying high-grade ore, has been discovered on the 75-ft. level.

Trethewey—The new concentrator will start in a few days. A new high-grade vein has been found on the 65-ft. level of the No. 2 shaft.

Provincial—In sinking the shaft near the Savage property at 80 ft. a high-grade vein was cut. A crosscut will be run from the 100-ft. level to intercept it.

Maidens—A small steam plant will be installed shortly at this South Lorraine property. The Gilles and Grier lots, near the Maidens property, have been sold to Buffalo men for $30,000.

Hollinger—Returns from Ledoux & Co., New York, who have sampled 30 tons of ore shipped, give the value of the consignment as over $6000, or $200 per ton. The car shipped was engineer's sampling of each shooting down to the 60-ft. level, where crosscuts were made in two shafts 350 ft. apart.

Mexico

Chihuahua

La Republica—The quarterly statement to March 30 shows: Tons milled, 3870; production, 187,163 pesos; operating costs, including unwatering, 120,107 pesos; construction and equipment, 27,602 pesos.

Guanajuato

Guanajuato Consolidated—The return for March is as follows: Crushed 7790 tons of dry ore; concentrates shipped to smeltery 157 tons; gross value in products, 100,700 pesos; estimated profit, 25,400 pesos. Of this, 16,200 pesos has been expended on 554 ft. of development.

Guanajuato Amalgamated—This property, developed by L. P. Adams, has been sold to the Oro Grande Mines Company, affiliated with the Guanajuato Securities Company of New York. The property is at La Luz.

Guerrero

The Sultepec Light and Power Company has agreed to transmit electric power to Taxco on a guarantee of 600 horsepower.

Atlixtaca—This Taxco company will erect a cyanide plant.

Jalisco

Casados—Plans are drawn for a 225-ton mill to be erected in units of 75 tons each at this mine, owned by Consolidated Mining Company, W. R. Ramsdell, president.

Amparo—The three-compartment shaft, sinking from the 700-ft. level, is down 200 ft. The shaft will be sunk to 1300 feet.

San Antonio—This property, on the Real Alto, San Sebastian district, has been secured by J. B. Wilson, of Louisville, Ky. An option on the Carmen mine, Cuale district, has been surrendered.

Neuva Leon

Cruz de Aire—This lead-silver mine at Sabinas Hidalgo has been sold to A. Bueno, of Mexico City, on the basis of 354,000 pesos for one-half of the stock.

Sonora

North Tigre—About 35,000 tons of milling ore is blocked out for extraction. The installation of a 100-ton concentrator and a cyanide plant of the same capacity is under advisement.

Dawson—This concern, which has held claims in the Moctezuma district, has gone into bankruptcy.

Otate—New hoisting and pumping equipment is being set up at the mine near Llano.

Moctezuma-Arizpe—The reorganization has been completed, 350,000 shares having been turned into the new corporation.

Cabibas—A 10-stamp mill has been moved from the Quiptoa range to the Rochester camp in the Cabibas mountains.

Minneapolis Copper Company—This company has properties 28 miles southwest of Cumpas. Several hundred thousand tons of sulphide ore are now in sight as a result of 5000 ft. of development. The company is actively engaged in developing.

Africa

Rhodesia

Gold production in Rhodesia is reported at 54,277 oz. in March. For the three months ended March 31, the total was 156,633 oz., or $3,237,604; an increase of $321,400 over last year. Other productions in March included 18,267 oz. silver, 8 tons copper, 56 tons lead, 1714 tons chrome ore and 12,272 tons coal.

West Africa

Gold output of the Gold Coast and Ashanti in March was 17,627 oz. For the three months ended March 31, the total was 67,406 oz. bullion in 1909, and 51,960 oz. in 1910; a decrease of 15,446 oz. The bullion reported this year was equal to $1,027,460, or 49,708 oz. fine gold.

South America

British Guiana

Gold exports from British Guiana for the three months ended March 30 were 12,957 oz. bullion in 1909, and 11,059 oz. in 1910; a decrease of 1898 oz. The bullion reported this year was equal to $192,695, or 9323 oz. fine gold. Exports of diamonds were 1153 carats, valued at $5255; an increase of 704 carats.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, May 4—There is little to be said of the coal trade in the East. The only effect which the Western troubles can now have on the seaboard bituminous trade is to withdraw some West Virginia supplies, and that will not be unwelcome. The anthracite trade is quiet and steady, as usual.

In the West, conditions remain disturbed and uneven. In the Pittsburg district a settlement has been reached and mining is being gradually resumed. In Ohio slow progress is being made in finishing up the district contracts. In Indiana a settlement of differences is in sight, and the same may be said of Iowa. In Illinois, however, operators and miners are as far apart as ever, and in the Southwest there is no approach to a settlement. Operators are anxious to resume work; in some districts the miners are tired of idleness and approaching the end of their funds. This may hasten matters a little.

A full account of the Pittsburg agreement is given on another page, and notes on other districts will be found in the correspondence which follows.

Meantime, the stocks of coal carried over are being gradually exhausted, and in many places some scarcity of coal is being felt. Kentucky and West Virginia coals are beginning to be important in the markets.

Coal Rates in Ohio—In response to a question submitted by the State Senate, the attorney-general of Ohio gives his opinion that the railroads in the Ohio Coal Traffic Association have violated the anti-trust law, but that they cannot be reached under the present law. He recommends an amendment to the law under which they can be sued.

Coal Traffic Notes

Norfolk & Western coal shipments, nine months of fiscal year July 1 to March 31, short tons:

District:	Commercial.	Company.	Total.
Pocahontas	7,079,775	945,966	8,025,741
Tug River	1,106,893	143,308	1,250,201
Thacker	1,084,614	521,682	1,606,296
Kenova	488,657	138,161	626,818
Clinch Valley	484,709	43,098	527,807
Total	10,244,648	1,792,215	12,036,863

The total shipments show an increase over 1808-9 of 2,783,846 tons, or 30.1 per cent.

The Consolidation Coal Company reports its tonnage for the year 1909 as follows:

	Coal.	Coke.
Maryland division	1,649,457	.....
West Virginia division	4,125,300	45,013
Pennsylvania division	1,550,366	17,428
Total.	7,325,123	62,441
Total, 1908	7,159,492	37,931

Increase in coal mined last year, 165,631 tons, or 2.3 per cent.; in coke made, 24,511 tons, or 64.6 per cent.

New York

Anthracite

May 4—Spring weather has quieted down the domestic trade. A large part of the local trade, however, consisting in the supply of electric light and power stations, and of factories, shows little change.

On May 1 the discount was reduced 10c. per ton, and schedule prices for domestic sizes are now $4.35 per ton for lump and $4.60 for egg, stove and chestnut, f.o.b. New York harbor. Prices of steam sizes show no changes.

Bituminous

The seaboard coal trade is quiet, but in fair condition. Orders are again coming in a little more freely both from the far East and from nearer New England territory. Inquiries are good, and some result in business. All-rail trade is reported about as usual.

New York harbor trade is steady, but still shows a preference for the lower-priced coals. Prices are about the same as they have been for several weeks past. There is some talk of smaller supply of West Virginia coal, owing to the demand for that coal from the West; but no shortage has yet developed.

Car supply has held up a little, but is still better than it was a few weeks ago. Transportation is generally good, with only occasional delays.

In the coastwise-vessel market, boats are in fair supply and there is no material change in rates.

Birmingham

May 2—Coal production in Alabama shows very little difference, though the demand has slackened up a little. The larger mines in the State are being operated on full time and the coal is being handled promptly. Coal prices are off a little but contracts are not being made beyond the summer months. The Pratt Consolidated Coal Company, through a subsidiary company in New Orleans, is handling 10,000 tons of coal per month from this district, which is being used mostly on steamships and for railroads in Mexico. A large trade through New Orleans is being worked up with the cooperation of the railroads, which have made a low rate from the Birmingham district to New Orleans.

Following a meeting of the Alabama Coal Operators' Association the past week, announcement was made that the coal miners and mine workers in the Birmingham district would receive an advance in wages of 5 per cent. effective May 1. About 20,000 men are affected by the increase in wages.

Chicago

May 2—The coal market is still hardly in existence, with something more of demand each day for supplies from the small consumers, but with no evidence that large consumers have yet reached the bottoms of their storage piles. It seems probable that the greater number of large consumers can hold out for another half month. Activity exists in the smokeless market and in such Western fine coals as reach market, for the consumer buying in the open market is insistent upon getting fine coals. Anthracite has had a fair April sale, due both to the approach of the end of the month and to the cool weather which has continued over Chicago terrietory. Considerable Western lump might be sold for domestic purposes if it were available, but it is not in the market.

Screenings are active when obtainable, at $2.40@2.60; run-of-mine and lump from Illinois and Indiana mines are out of the market. Smokeless is active and not in oversupply, generally at $3.55 for lump and egg and $3.15 for run-of-mine. One result of the market's short supply in April is an increased use of screenings and run-of-mine by consumers who formerly used lump, so that some dealers predict a lasting increase in the consumption of fine coals and corresponding decrease in the use of lump.

Cleveland

May 2—Since the opening rush, the Lake trade has been dead. Boats are waiting for cargoes, but coal is not coming to the ports.

Locally, there is little trade. Factories are running on their stocks and are not buying coal. The only apparent demand is for slack, and there is little of that to sell. Prices are wholly nominal in the absence of sales.

Indianapolis

May 2—Two more conferences by committees from the Indiana Miners' conven-

tion and the Indiana Operators' Association were held during the past week, the last one resulting in a temporary agreement. A report on a tentative agreement was rejected by the mine workers when first presented but was subsequently taken up again and amended in such a manner as to leave only one question in dispute.

The miners are opposed to returning to work pending negotiations while the fine clause remains. They say if they do the fight against the fine of $1 a day for stampede strikes will be weakened. The wage contract contains an arbitration method of adjusting local grievances at a mine and the fine is for failure to comply with this method which requires the men to continue at work at that particular mine while the arbitration proceeds. The operators are anxious to open their mines and there are strong indications that the miners will return to work this week. The settlement of the wage agreement in the Pittsburg field has helped the settlement in Indiana.

The situation is growing serious. There is little coal left in Indiana and in places factories and contract work have shut down for the lack of coal. The independent mines are producing a little coal but not enough to supply the demand.

Pittsburg

May 3—Most of the coal miners in the district have already gone to work, pursuant to the compromise agreement reached at midnight last Friday. The terms are given on another page.

The coal market is not regularly developed as yet, coal producers being engaged in resuming shipments to their regular customers. The supply of cars today was satisfactory, and no trouble is expected on this score. Lake shipments are to be started at once. We quote tentatively as the market: Mine-run and nut, $1.25; ¾-in., $1.35; domestic 1½-in. lump, $1.50; slack, 85c. per ton.

Connellsville Coke—The market has been quiet. Prices have not yielded since the settlement of the wage matter in the union district, but the market has not been seriously tested, and is quotable at $1.75@1.80 for prompt furnace, $2.10@2.25 for contract furnace, $2.25@2.35 for prompt foundry and $2.35@2.50 for contract foundry, for standard grades. The coke subsidiary of the Steel Corporation put out about 2000 ovens during April and will doubtless need to put out about 2000 more, considering the blast furnaces it is putting out.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended April 23 at 425,152 tons, a decrease of 13,000 tons from the preceding week, and shipments at 4856 cars to Pittsburg, 7562 cars to points west of Pittsburg and 925 cars to points east of Connellsville, a total of 13,343 cars. The high point in production was about Feb. 1, when the weekly production was 475,000 tons.

St. Louis

May 2—The situation in St. Louis remains unchanged. Prices have remained about stationary for the past week for Kentucky coal. The demand has been fair for coal, though there has been no particular rush and no one has suffered. It is estimated that there are 100 cars per day approximately coming into St. Louis from outside sources. This amount is apparently taking good care of the market. From this it can be seen that buying is comparatively light, as the daily consumption is approximately 800 cars exclusive of the railroads, which consume another 800 cars per day. The railroads, however, have still over six weeks' supply on hand and have bought nothing since the shutdown.

The Illinois operators are now in joint conference with the miners in Chicago, and reports from them would indicate that very little is being done toward effecting a settlement. There seems to be very little chance of work being resumed for another month yet.

The anthracite trade has been better toward the end of the month, as dealers were able to clear out their bins, which were filled with soft coal, during the cold spell last week.

On this account a number of them were able to get additional supplies of hard coal, which they had not expected.

Current prices for coal are as follows:

	F.o.b. Mine.	F.o.b. St. Louis.
Standard:		
6-in. lump	2.50	3.02
2-in. lump	2.25	2.77
Mine-run	2.00	2.52
2-in. nut	2.00	2.52
2-in. screenings	2.00	2.52
Pea and slack	1.75	2.27
Staunton, Mt. Olive & Springfield:		
6-in. lump	2.50	3.02
3-in. lump	2.25	2.77
Mine-run	2.00	2.77
2-in. nut	2.00	2.77
2-in. screenings	2.00	2.77
Carterville:		
6-in. lump or egg	2.50	3.17
3-in. nut	2.50	3.17
Mine-run	2.00	2.67
1½-in. screenings	2.00	2.67
Franklin County:		
6-in. lump or egg	2.50	3.17
3-in. nut	2.50	3.17
2-in. nut	2.00	2.67
1½-in. screenings	2.00	2.67
Trenton:		
6-in. lump	2.50	3.02
6-in. egg	2.50	3.02
3-in. nut	2.50	3.02
Pennsylvania Anthracite:		
Nut, stove and egg		6.55
Grate		6.30
Arkansas Anthracite:		
Egg or grate	3.35	5.35
Coke:		
Connellsville foundry	2.50	5.30
Gas house		4.40
Smithing coal	1.65	4.15

Kentucky coal sells at $2.50 for 2-in. lump, $2.35 for run-of-mine, and $2.20 for screenings; all f.o.b. Louisville & Nashville tracks, East St. Louis.

FOREIGN·COAL·TRADE

United States Coal Exports—Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, three months ended March 31, long tons:

	1909.	1910.	Changes.	
Anthracite	428,974	531,252	I.	102,278
Bituminous	1,516,160	1,898,209	I.	382,049
Total exports	1,945,134	2,429,461	I.	484,327
Steamer coal	1,387,767	1,501,535	I.	113,768
Total coal	3,332,901	3,930,996	I.	598,095
Coke	246,791	240,841	D.	5,950

Canada took this year 1,598,182 tons coal, or 65.8 per cent. of the total. The coke went chiefly to Mexico and Canada. Cuba took 210,398 tons of coal. Of the bunker coal this year 1,497,859 tons were loaded at coast ports and 3676 tons on the Lakes.

United States Coal Imports—Imports of coal and coke into the United States, three months ended March 31, long tons:

	1909.	1910.	Changes.	
Anthracite	3,115	17	D.	3,098
Bituminous	308,354	475,655	I.	167,301
Total coal	311,469	475,672	I.	164,203
Coke	54,573	31,703	D.	22,870

Canada furnished this year 410,246 tons of coal and nearly all the coke; Australia, 18,851 tons of coal; Japan, 42,212 tons of coal. Imports are chiefly on the Pacific Coast and in the far northwestern States.

British Columbia Coal—The Crow's Nest Pass Coal Company reports for 1909 a total of 899,045 tons mined, a decrease of 52,600 tons from 1908; coke made was 250,254 tons, a decrease of 12,304 tons.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of Welsh coal as follows, on April 23: Best Welsh steam, $3.90; seconds, $3.78; thirds, $3.66; dry coals, $3.72; best Monmouthshire, $3.60; seconds, $3.42; best steam smalls, $2.16; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, May 4—The iron and steel markets show few changes from the position reported last week. Buyers are apparently waiting for further reductions in prices, and are not yet satisfied that the bottom has been reached, while sellers are not yet pressing for trade to the point of making any large concessions.

In pig iron transactions have been of a moderate order only. Production is being gradually curtailed, and a number of furnaces have gone out of blast; not enough yet, however, to reduce the make of iron below a pretty high level. In the Central West, both foundry and steel irons have been sold only in a small way. In Eastern territory foundry iron has sold a little more freely, but the market is

still disturbed by offers of cheap Southern iron.

In finished material there are some heavy contracts for structural steel pending, but not yet concluded. Other structural business has been of a small order, but there are reports of low prices. Plates are in a little better demand. The railroads are placing few orders, either for bridges or equipment. The Boston & Maine has given a considerable order for rails, divided betwen the Steel Corporation and the Maryland Steel Company. Some export orders for rails are also noted, for Mexico and Australia.

Depressed conditions in Wall Street and the suspension of coal mining in the West are both tending to influence the iron markets unfavorably.

Wage Increases—It is announced that the Jones & Laughlin Steel Company and the Republic Iron and Steel Company will follow the example of the Steel Corporation and grant a general increase in wages. It is understood that the independent companies take this action reluctantly, but believe that it is necessary in order to avoid trouble.

New wage rates have not been figured out fully, but it can be stated that the wage advances being made, on the initiative of the Steel Corporation, do not figure out as large a percentage as was at first expected. Common labor is advanced 10c. a day, except that in some cases the advance is made 1c. per hour, on a 12-hour day. Other advances are largely to bricklayers, machinists, carpenters, etc., the wages in which crafts have been advanced outside the mills, and the present advance is really simply a readjustment. The Steel Corporation has advanced its tonnage men in the sheet mills by about 3 per cent. and in the tin mills by about 4½ per cent., but the outside mills are not following this advance.

Baltimore

May 2—Imports for the week included 369 tons spiegeleisen, 1509 tons ferromanganese and 7 kegs ferrotitanium from Great Britain; 2050 tons spiegeleisen, 100 tons ferromanganese and 600 tons manganese ore from Rotterdam; 33,200 tons iron ore from Cuba. Exports included 2150 tons steel rails to Brisbane, Australia; 605,700 lb. zinc dross to Liverpool.

Birmingham

Some spot sales in the last few days has had a buoying effect on the iron market. The blowing out of a couple of furnaces recently has reduced the make and there is no further accumulation of iron noted. Prices in this section are a little weak yet. Inquiries are being received here for iron to be delivered during the last quarter of the year and some business is expected to result. The price is $12@12.50 for delivery during the third quarter. Spot iron has been selling at $12 per ton, No. 2 foundry. Some large consumers are said to have recently made a bid for a good quantity of iron, but the quotation desired was not met by the manufacturers. Low-grade irons have been in steady demand recently by cast-iron pipe makers. There is no hesitation at the pipe plants in the South. The home consumption of iron has not changed. Furnace companies are not willing to sell under $12.50 per ton, No. 2 foundry, for iron to be delivered during the fourth quarter of the year. The Tennessee Coal, Iron and Railroad Company gave its employees, miners, mine-workers, furnacemen, steel workers and others an advance on May 1, in line with the policy of the United States Steel Corporation.

Chicago

May 2—Sales of pig iron continue to be light and seem destined not to increase until the founders shall conclude that the market is not overstocked. Buying is in small lots mainly, for delivery one to three months hence, and last-half requirements are still largely uncontracted for. Southern No. 2 foundry remains at $12 Birmingham on nearly all sales, with perhaps a few contracts made 25 or 50c. less. This means $4.35 more in Chicago, or $16.35, against $17@17.50 for Northern No. 2. The reduction of Northern output will do much to stimulate the market, for at bottom the present holding off of buyers is due to a belief in overproduction. Sales of iron and steel products are fair, though by no means brisk, and no extensive new business seems in sight. The pig-iron requirements for the last half are not being met and are the subject of much inquiry from large and small interests. If the large interests meet their needs by heavy purchases as soon as they consider the bottom point of the market reached, there no doubt will be an upward turn. Otherwise, a dull and dragging market for an indefinite time seems in order.

Cleveland

May 2—Nothing doing in iron ore sales. The first starters from Lake Superior have been delayed by bad weather, and ore is slow to arrive.

Pig Iron—The market is dull, with few sales. Several furnaces in this district have gone out of blast, and several more are going. Bessemer can be had around $18; No. 2 foundry, $16.50@16.75; No. 2 Southern, $16.35; forge, $16@16.25; all Cleveland delivery.

Finished Material—Some small orders for structural and bridge work make up the total for the week. Except for bars and plates, the mills are not at all crowded, and are looking for more work.

Philadelphia

May 4—Some of the pig-iron makers of this territory have been anxiously soliciting business, especially in forge and foundry irons. It has not transpired on what terms and basis the business is sought for, as the furnace interests now assert that there has been no general drop in prices and at present no occasion for it. The furnace banks are practically clear of iron, shipments being made according to contract terms. Inquiries which have come to hand, mainly from New England sources, indicate that only small quantities of iron are wanted at present. Reports from salesmen who have just been over New England territory make it clear that there is comparatively little iron in the yards and very little anxiety to purchase at this time beyond what will be needed to cover work in hand. Basic pig is not quoted as strong and orders are unimportant. No. 2 foundry has been sluggish; small sales of malleable iron are reported.

Steel Billets—New work calling for small billets has been falling off recently and there is a disposition among buyers to go slow.

Bars—Bar iron has dropped off, both at stores and mills. This is, no doubt, a temporary dullness and quotations are still held up.

Sheet—The week shows a falling off in the amount of business done and especially in the size of the orders placed. Business is not rushing at the mills.

Pipes and Tubes—Additional business in cast pipe has just come to hand. In merchant pipe distribution has been unimportant. In tubes prices are firm at recent quotations.

Plates—Concessions have been asked for by two or three of the larger buyers of plates for material that will not be wanted until late in summer. It is believed that the slight concessions will be granted and the orders booked. In a general way, plate is strong.

Structural Material—The only reported sales this week are for lots ranging from 50 to 150 tons, much of it for small local enterprises.

Steel Rails—A few small orders for mine rails have just been sent to the mills and some good business is in sight for trolley-building purposes.

Scrap—The scrap-iron market happens to be lifeless at present, but a number of recent purchases of material have restored stocks in several of the yards.

Pittsburg

May 3—The curtailment in iron and steel production proves to be more serious than was expected. The Carnegie Steel Company is blowing out a total of 17 blast furnaces, since April 1, about a dozen of these having already gone out,

while the remainder will go out within 10 days. This is out of a total of 53 furnaces. Other Steel Corporation subsidiaries are blowing out furnaces, the National Tube Company, for instance, having put out two of the four McKeesport furnaces within the past fortnight. The Steel Corporation has a total of 127 furnaces, all but a very few having been in operation, and it may be estimated roughly that from April 1 to May 15 it is blowing out close to 25 furnaces, a curtailment of close to 20 per cent. The independent steel works are also curtailing production but, on the whole, hardly as much. The merchant blast furnaces, however, are blowing out right and left, so that the Steel Corporation percentage is pretty well maintained on the outside, and it may be estimated roughly that while in March the country was making pig iron at the rate of a trifle over 31,000,000 tons a year, by the latter part of this month the rate will be about 28,000,000 tons. This, however, represents the best rate ever attained before this movement.

The market has continued stagnant as to absolutely new business in pig iron and finished-steel products, but shipments are fairly maintained by reason of the momentum at which trade was moving earlier in the year. Consumers of pig iron are taking iron fairly well on old purchases, and buyers of finished steel are specifying fairly well on their contracts.

Prices show no quotable change. There has been scarcely any business negotiated in finished steel, so that there has been no particular incentive to cut prices. It is quite certain that when business of importance is offered there will be a scramble for it, and this will doubtless result in price cutting, but for the moment it is hardly fair to quote lower prices as representing the existing market.

Pig Iron—There has been scarcely any pig-iron business done in the local market during the past week. Prices are quotable on a slightly lower level, from general information as to what could actually be done, as follows, at Valley furnaces: Bessemer, $17; basic, $15.75; No. 2 foundry, $15.50; malleable, $15.75; gray forge, $15. The bessemer average for April is announced at $17.37½, Valley, against $17.58 in March, a high point of $19 in November, December and January, and a low point last year of $14.58 in May. The basic average for April is arrounced at $15.9375, against $16 in March, a high point of $17.48 last November and a low point last year of $14.12, in May.

Steel—The market has been quiet. Prices on open-hearth steel are well maintained, but bessemer steel can be had at concessions. We quote $26@26.50 on bessemer billets, $27@27.50 on bessemer sheet bars, $28.50@29 on open-hearth billets, and $29@29.50 on open-hearth sheet bars, with rods at $32, all prices being f.o.b. maker's mill, Pittsburg or Youngstown.

Ferromanganese—The market is somewhat softer, owing to odd lots seeking prompt disposal. We quote prompt at $40@40.50, Baltimore, and forward at $40.50@41, freight to Pittsburg being $1.95 per ton.

Sheets—There is only a moderate amount of business. Some mills are well filled, while others are seeking business, generally at a cut of $1 a ton from the regular prices of 2.40c. on black and 3.50c. on galvanized. Corrugated roofing is fairly steady at the regular prices of $1.70 per square for painted and $3 for galvanized. Blue annealed sheets for prompt delivery are held at 1.85c. for No. 10 gage, and this insures delivery in about four weeks. For farther forward delivery the regular price of 1.75c. is done.

FOREIGN IRON TRADE

German Iron Production—The German Iron and Steel Union reports pig-iron output in March at 1,250,184 tons. For the three months ended March 31 the total make was, in metric tons:

	1909.	1910.	Changes
Foundry iron	560,882	675,747	I. 114,865
Forge iron.....	170,396	167,551	D. 2,845
Steel pig.....	277,416	314,527	I. 37,111
Bessemer pig.....	110,405	120,929	I. 10,524
Thomas(basic)pig	1,925,405	2,240,355	I. 314,950
Total.....	3,044,504	3,519,109	I. 474,605

The total increase this year was 15.6 per cent. Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

METAL MARKETS

New York, May 4—The metal markets have been rather irregular and inclined to lower prices. The exception is silver, which is firm at the recent advance.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Mar. 1910..	$ 1,815,329	$ 4,492,229	Imp. $ 2,676,900
" 1909..	21,252,462	" 5,161,648	Exp. 16,090,814
Year 1910..	10,915,595	9,686,702	" 1,228,893
" 1909..	37,978,632	12,158,275	" 25,820,357
Silver:			
Mar. 1910..	4,553,110	3,872,912	Exp. 680,198
" 1909..	5,079,287	3,279,531	" 1,799,756
Year 1910..	13,640,033	11,276,595	" 2,363,438
" 1909..	14,473,930	10,453,218	" 4,020,712

Exports from the port of New York, week ended April 30: Gold, $17,087,900; silver, $856,900, both chiefly to London. Imports: Gold, $114,927; silver, $130,975, both from Cuba, Central and South America.

Gold—The price of gold on the open market in London remained at 77s. 9d. per oz. for bars. The Bank of England withdrew the premium offered for American coin, and it was quoted at 76s. 5d. per oz. After last week's rush of exports from New York there was a lull, no large amount being taken.

Platinum—The market remains quiet but steady, and prices are unchanged. Dealers ask $29@29.50 per oz. for refined platinum and $34.50@35 per oz. for hard metal.

Silver—The market has been well maintained this week rising to 24 15/16d. in London, the highest quotation of the year, and closing steady at 24⅞d. India bazaars have continued large buyers and China has been the chief seller. The undertone of the market still continues good on prospects of a big wheat crop in India.

SILVER AND STERLING EXCHANGE

Apr.-May.	28	29	30	2	3	4
New York....	54¼	54	54¼	54¼	54⅛	54⅛
London.....	24⅛	24⅛	24⅛	24⅛	24⅞	24⅞
Sterling Ex..	4.8795	4.8775	4.8775	4.8765	4.8760	4.8760

New York quotations, cents per ounce troy. fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East from Jan. 1 to April 21, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India.....	£1,404,400	£2,081,800	I. £ 677,400
China.....	983,200	1,088,500	I. 105,300
Straits.....	82,800	.....	D. 82,800
Total.....	£2,470,400	£3,170,300	I. £ 699,900

India Council bills brought an average of 16.09d. per rupee in London.

Foreign commerce of the United States, three months ended March 31, as reported by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1909.	1910.
Exports.....	$ 422,055,943	$ 412,719,928
Imports.....	355,103,953	426,748,734
Excess.....	E.$ 66,951,990	I. $14,028,806
Deduct excess of exports, silver.....		2,363,438
Deduct excess of exports, gold.....		1,228,893
Total import balance.....		$ 10,436,475

The balance for the quarter shows an excess of import values, an unusual condition.

Gold and silver movement in Great Britain, three months ended March 31:

	Imports.	Exports.	Excess.
Gold .....£	11,249,953	£12,154,389	Exp. £ 904,436
Gold, 1909...	16,131,463	10,184,832	Imp. 5,946,631
Silver.....	3,580,131	3,555,220	Imp. 24,911
Silver, 1909.	3,339,828	3,156,161	Imp. 183,667

Of the silver imports this year £2,856,477 were from the United States.

Gold and silver movement in France, two months ended Feb. 28:

	Imports.	Exports.	Excess.
Gold ..Fr.	93,196,000	F. 33,827,000	Imp.Fr. 59,369,000
1909..	154,591,000	12,165,000	Imp. 142,426,000
Silver.	21,100,000	26,603,000	Exp. 5,503,000
1909..	21,827,000	14,951,000	Imp. 6,876,000

Imports of copper and nickel coins this year were 7000 fr.; exports, 139,000 fr.

Copper, Tin, Lead and Zinc

Apr.-May.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
28	12¾ @13	12⅝ @12⅞	57⅛	32⅞	4.35 @4.37½	4.20 @4.25	4.95 @5.00
29	12⅝ @12¾	12¼ @12⅜	57	32¾	4.35 @4.37½	4.20 @4.25	4.92½ @4.95
30	12⅝ @12¾	12¼ @12⅜	....	32⅞	4.35 @4.37½	4.20 @4.25	4.90 @4.95
2	12⅝ @12¾	12¼ @12⅜	56 15/16	33	4.35 @4.37½	4.20 @4.22½	4.90 @4.92½
4	12⅝ @12¾	12¼ @12⅜	56 15/16	32¾	4.35 @4.37½	4.20 @4.22½	4.87½ @4.90
5	12⅝ @12¾	12⅜ @12¾	55⅞	32⅝	4.35 @4.37½	4.20 @4.22½	4.85 @4.90

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Encouraged by the weakness of the stock market, domestic consumers continued to hold aloof, while European buyers showed more interest. There has been a steady demand from the latter quarter at lower prices, and this demand has been freely met. The market closes barely steady at 12⅝@12⅞c. for Lake copper, and 12¼@12⅜c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 12¼@12⅜ cents.

Copper sheets have been reduced 1c. per lb., and are now 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14¼c. base, carload lots at mill.

Business in the London market has been of small volume and prices have declined steadily, closing at £55 7s. 6d. for spot and £56 7s. 6d. for three months.

Refined and manufactured sorts are quoted: English tough, £58 10s.; best selected, £59@£59 10s.; strong sheets, £67 10s.@£68 10s. per ton.

Copper in April—The downward tendency in the copper market, which became prominent before the middle of March, continued practically without interruption through April. The month began at about 13 1/16c. for electrolytic with most of the agencies making strong efforts to effect sales. By April 9 the price had fallen to 12¾c. On that date the Calumet & Hecla reduced its price for Lake copper to 13c. and made some large sales. The sellers of electrolytic immediately became more urgent and sold some large blocks of copper at 12.65@12.70c., their sales being chiefly for foreign delivery. The large business continued up to the middle of the month, with a slight stiffening of price, but upon April 18 the market became weak again, demand having dwindled, and from that time onward the price for electrolytic slumped steadily to 12⅜c. as the closing for the month, a fair volume of business being transacted upon the decline.

Tin—In expectation of very favorable statistics, the market in London remained very steady; this in face of the disturbing conditions in all other metal markets. Upon the publication of the statistics, which showed a decrease in the visible supply of almost 2300 tons, prices advanced about 15s. This advance, however, was not maintained and sentiment changed, and the market closes weak at £148 12s. 6d. for spot and £150 2s. 6d for three months.

The domestic market continues to be very quiet. Retail business in Straits tin is almost nothing. Small consumers are using a good deal of low-grade tin, which is imported mostly from Bolivia and China, and this is selling at a considerable discount from the ruling quotations for Straits tin, but seems to answer fully the purposes of its uses. At the close, spot tin can be bought at about 32⅝ cents.

Visible stocks of tin on May 1 are reported as follows, including tin afloat: London, 10,287; Holland, 2076; United States, excluding Pacific ports, 5569; total, 17,932 long tons, a decrease of 2271 tons as compared with April 1; and of 893 tons as compared with May 1 last year.

Lead—The market is quiet and somewhat easier at 4.35@4.37½c. New York, and 4.20@4.22½c. St. Louis.

The London market is also somewhat lower, Spanish lead being quoted at £12 7s. 6d., and English at £12 10s. per ton.

Imports of lead material into the United States in March included 15,955 tons of ore, containing by assay 7,571,574 lb. lead; and 10,042,235 lb. base bullion, containing 9,824,579 lb. lead; total contents being 17,396,153 lb. lead, of which 17,392,573 lb. came from Mexico.

Spelter—The demand is small and has not been sufficient to take care of all the metal that is offered. In consequence, prices have suffered and the market closes weak 4.85@4.90c. St. Louis, and 5@5.05c. New York.

New York quotations for spelter, April 28, were 5.10@5.15c.; April 29, 5.07½@5.10c.; April 30, 5.05@5.10c.; May 2, 5.05@5.07½c.; May 3, 5.02½@5.05c.; May 4, 5@5.05 cents.

The London market is unchanged at £22 for good ordinaries, and £22 5s. for specials.

Base price of zinc sheets on April 28 was reduced 25c. to $7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—Business remains active, with numerous inquiries. Prices are unchanged, at 23¼@23¾c. per lb. for No. 1 ingots in large lots, New York. The market abroad continues strong and active.

Antimony—The market continues quiet, with sales of a retail order only, and prices are nominally unchanged. Quotations are 8⅜@8½c. for Cookson's; 7⅞@8c. for U. S.; 7⅜@7½c. for outside brands.

Quicksilver—The market here is steady. New York quotations are $48 per flask of 75 lb.; jobbers ask 67@69c. per lb. for small lots. San Francisco, $47.50@48 for domestic orders, and $2 less for export. The London price is £9 per flask; with £8 17s. 6d. quoted by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Imports and Exports of Metals

Exports and imports of metals in the United States, three months ended March 31, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	73,709	34,766	Exp. 38,943
Copper, 1909....	59,982	34,597	Exp. 25,385
Tin, long tons....	135	13,448	Imp. 13,313
Tin, 1909.....	114	11,526	Imp. 11,412
Lead, short tons.	19,799	27,173	Imp. 7,374
Lead, 1909.....	21,219	24,978	Imp. 3,759
Spelter, sh. tons.	264	1,031	Imp. 767
Spelter, 1909....	1,382	1,061	Exp. 321
Nickel, lb.....	3,533,606	8,855,987	Imp. 5,322,381
Nickel, 1909....	2,618,037	4,284,113	Imp. 1,666,076
Antimony, lb....	.....	2,709,170	Imp. 2,709,170
Antimony, 1909.	2,616	2,271,460	Imp. 2,268,844
Platinum, oz.....	... .	24,494	Imp. 24,494
Platinum, 1909.		29,673	Imp. 29,673
Quicksilver, lb..	84,897	.....	Exp. 84,897
Quicksilver, '09	10,303	.....	Exp. 10,303
Aluminum, value	$93,477	.....	Exp. $93,477
Aluminum, 1909	24,340	.....	Exp. 24,346
Ores, etc.:			
Zinc oxide, lb. ..	7,466,773	.....	Exp. 7,466,473
Zinc oxide, '09..	7,353,417	.....	Exp. 7,353,417
Zinc dross, lb....	1,526,410	.....	Exp. 1,526,410
Zinc dross, '09..	5,014,932	.....	Exp. 5,014,932
Zinc ores, lg.tons	6,394	16,964	Imp. 10,570
Zinc ores, 1909.	2,025	18,668	Imp. 16,643
Antim'y ores, lb.	.....	.....	.....
Ant. ores, 1909.	504	3,171,923	Imp. 3,171,419
Chrome ore, tons	20	8,284	Imp. 8,264
Chrome ore, '09	.....	7,540	Imp. 7,540

Copper, lead and nickel (and antimony from Aug. 5, 1909) include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Zinc contents of ore imported in 1910, were 12,856,541 lb.; not reported prior to date of new tariff. Quantity of antimony ore is not reported this year, only metal contents being given. Exports of copper sulphate this year were equivalent to 594,000 lb. copper.

Zinc and Lead Ore Markets

Platteville, Wis., April 30—The base price of 60 per cent. zinc ore started Monday at $41 per ton but slumped to

$39 per ton at the week end. One car of lead ore brought $50 per ton.

SHIPMENTS, WEEK ENDED APRIL 30.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	657,200	.....	.....
Platteville	520,250	.....	467,800
Galena	244,440	.....	.....
Cuba City	164,075	.....	.....
Highland	131,500	72,500	.....
Montfort	64,790	.....	.....
Total	1,782,255	72,500	467,800
Year to date	27,509,875	1,820,439	5,078,090

In addition to the above there was shipped to the separating plants, 2,338,273 lb. zinc concentrates.

Joplin, Mo., April 30—The highest price paid for zinc sulphide ore was $44 per ton, the base ranging from $41 down to $38 per ton of 60 per cent. zinc. Zinc silicate sold on a base of $20@26 per ton of 40 per cent. zinc, with the high price at $29. The average price of zinc, all grades, was $37.86. The highest price for lead was $50 per ton, grading down $1 per ton for each 1 per cent. under 80 per cent. lead, with additional deductions for moisture. The average price, all grades of lead, was $49.36 per ton.

It can be said that the bottom dropped out of the zinc-ore market, as sales for next week's delivery have been made as low as $37 base. The result is the closing down of six of the mills in the north part of Webb City, with more reported favorable to stopping production at the end of another week if prices are not advanced. Just now the supply is greater than the demand, and the reserve stock has been increasing for several weeks, amounting to nearly 8000 tons tonight.

SHIPMENTS, WEEK ENDED APRIL 30.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	4,802,280	925,830	$116,789
Joplin	1,678,040	167,130	37,697
Duenweg	759,520	24,970	14,419
Galena	648,230	55,480	13,998
Alba-Neck	586,520	2,690	12,966
Aurora	453,960	.....	7,834
Granby	434,660	12,940	7,040
Spurgeon	198,690	134,480	6,093
Carthage	275,040	.....	5,775
Quapaw	286,270	.....	5,295
Miami	214,720	112,490	4,959
Carl Junction	101,360	27,620	2,790
Sarcoxie	191,360	.....	2,634
Jackson	97,620	5,640	1,988
Saginaw	108,930	15,460	1,767
Badger	61,140	.....	1,222
Totals	10,898,340	1,494,730	$243,266
4 months	201,144,720	28,904,550	$4,886,848

Zinc value, the week, $206,371; 4 mos., $4,114,099
Lead value, the week, 36,895; 4 mos., 772,749

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	.....	37.42	.....	56.59	.....
June	44.15	.....	40.35	.....	57.52	.....
July	43.06	.....	41.11	.....	53.74	.....
August	48.25	.....	44.54	.....	57.60	.....
September	47.70	.....	44.87	.....	56.11	.....
October	49.50	.....	45.75	.....	55.02	.....
November	51.31	.....	48.29	.....	53.94	.....
December	49.45	.....	47.57	.....	55.26	.....
Year	$43.98	.....	$41.20	.....	$54.60	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, May 4—The general market continues quiet, with business chiefly on the contract basis.

Copper Sulphate—There has been a slight decline in prices, and quotations are now $4 per 100 lb. for carload lots, and $4.25 per 100 lb. for smaller orders.

Arsenic—The market remains dull and prices are unchanged, $2.40@2.50 per 100 lb. being quoted for white arsenic.

Nitrate of Soda—The market has quieted down, as is usual at this time of year. Spot nitrate is still quoted at 2.15c. per lb., while 2.05c. per lb. is named for futures.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, three months ended March 31:

	Imports.	Exports.	Excess.
Copper sulph. lb.	.....	2,379,816 E.	2,379,816
Copper sul., '09	.....	1,719,158 E.	1,719,158
Bleach, lb	25,178,652	..... I.	25,178,652
Bleach, 1909	22,877,205	..... I.	22,877,205
Potash salts, lb.	191,522,112	997,301 I.	190,524,811
Potash salts, '09	88,338,311	1,170,369 I.	87,167,942
Soda salts, lb.	7,839,103	150,085 I.	7,689,018
Soda salts, 1909	3,066,524	180,826 I.	2,885,698
Acetate lime, lb.	.....	18,002,262 E.	18,002,262
Acetate, 1909	.....	24,844,141 E.	24,844,141
Nit. of soda, tons	148,558	2,021 I.	146,537
Nitrate, 1909	95,864	2,051 I.	93,813
Phosphates, tons	4,194	204,272 E.	200,078
Phosphates, '09	847	247,375 E.	246,528
Sulphur, tons	8,307	5,841 I.	2,466
Sulphur, 1909	7,281	5,764 I.	1,517
Pyrites, tons	189,279	..... I.	189,279
Pyrites, 1909	157,876	..... I.	157,876
Magnesite, lb.	75,240,494	1,540,742 I.	73,699,752
Magnesite, 1909	.....	.....	.....

Exports include reëxports of foreign material. Figures for magnesite not reported separately prior to July 1, 1909. Estimating sulphur contents of pyrites, the total imports of sulphur in 1910 were 84,015 tons.

MINING·STOCKS $

New York, May 4—The record of the week on the Stock Exchange has been generally one of depression and falling quotations. Such news as there has been was unfavorably interpreted, and the bear party had things its own way for the most part. Trading was not heavy, however, and sellers of stocks had their offerings taken, but with no particular support in sight the market closes weak and irregular.

On the Curb there was also general depression. The copper stocks suffered even more than the rest, and some low prices were made for the active issues. Cobalt stocks were rather freely dealt in, and kept up better than any others. Other mining stocks were not much noticed. The depression continued at the close, which was quite as weak and irregular as on the Exchange.

Boston, May 3—Depression still continues in copper stocks, and prices have been seriously bumped the past few days, when it was thought that they had been sold pretty much to a standstill.

There are times when the market looks as if it might be rock bottom, but the persistent break in Amalgamated has only served to cause further liquidation in coppers. Amalgamated has fallen over $10, making a low at $63.25. Lake Copper shows good action marketwise and with proper surrounding conditions would do better. At times the daily fluctuations

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	January.	February.	March.
Arizona, Ltd.	2,646,000	2,658,000	2,886,000
Boleo (Mexico)	2,644,800	2,331,832	2,148,383
Copper Queen	10,001,000	8,927,203	10,809,488
Calumet & Ariz.	2,331,000	2,024,000	2,820,000
Cananea (Mexico)	3,500,000	3,586,000	3,700,000
Detroit	2,166,156	1,486,400	1,698,975
Imperial	850,000	750,000	825,000
Nevada Con. (Est.)	3,800 000	5,000,000	5,600,000
Old Dominion	2,130,060	2,035,000	2,674,000
Shannon	1,510,696	1 526,000	1,468,000
Superior & Pitts	2,166 000	1.864,000	2,370,000
Utah Copper Co.	4,745,066	5,798,819	8,190.000
Butte District	19,250,000	13,758,620	24,000,000
Lake Superior	19,260,127	18,250,000	19,250,000
Total production.	77.000,845	69,995,874	88,439,846
Imports, bars, etc.	24,305,526	14,093,381	20,178,202
Imp. in ore & matte	7,053,522	6,063,764	6,181,476
Total	108,359,893	90,153,019	114,799,524

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report for March includes for the first time the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
V, 1909	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767
IV	.....	.....	.....

	Visible Stocks. United States.	Europe.	Total.
V, 1909	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,860	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V	.....	246,870,400	.....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

are wide, yet the stock shows a strong inclination to advance. The closing tonight, however, was the lowest of the week, at $49.75, which represents an extreme decline of $4.75 for the week. The other new Lake stocks have not fared so well. North Lake has lost $4.62½ to $10 and Indiana $8.87½ to $16 per share.

Arizona Commercial had a final smash to $12.50 today, which is its low record and represents a decline of $4.50 for the week. This represented the selling out of an old bull account. In the general slump almost all stocks are off.

U. S. Smelting fell $3.25 to $39.25. Copper Range liquidation has taken the price of the stock off $5 to a low of $64.

Curb stocks have shown general declines, those of Chino, Bohemia, and Ohio being the most conspicuous.

Assessments

Company.	Delinq.	Sale.	Amt.
Blue Bell, Idaho	Mar. 14	June 1	$0.002
Brownstone, Utah	Apr. 15	June 10	0.00½
Bullion, Nev	May 8	June 6	0.05
Columbus Con., Utah		May 11	0.25
Con. Imperial, Nev	Apr. 19	May 12	0.01
Con. Virginia, Nev	May 9	June 3	0.20
Exchequer, Nev	Apr. 27	May 18	0.05
First Natl. Copper, Cal			1.25
Hector, Idaho	Mar. 28	May 26	0.00½
Helvetia, Ariz			0.50
Mangus Dev., Mich	May 7		2.50
Mexican, Nev	May 17	June 9	0.15
Mineral Farm, Idaho	Mar. 12	May 16	0.003
New Arcadian, Mich	Mar. 10		1.00
Ophir, Nev	Apr. 22	May 16	0.25
Overman, Nev	Apr. 6	Apr. 27	0.10
Potosi, Nev	Apr. 5	Apr. 28	0.10
Savage, Nev	May 2	May 27	0.10
Sierra Nevada, Nev	Apr. 7	Apr. 27	0.10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Ton. North Star	Apr. 21		0.03
Utah, Nev	Apr. 22	May 3	0.05
Utah Con. of Tintic, Utah	May 15		0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905		24.343	
June	52.538		24.166	
July	51.043		23.519	
August	51.125		23.588	
September	51.440		23.743	
October	50 923		23.502	
November	50.703		23.351	
December	52.226		24.030	
Total	51.502		23.706	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	New York.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.56½	12.733	12.93¾	13.091	57.363	57.238
May	12.893		13.238		59.338	
June	13.214		13.548		59.627	
July	12.880		13.363		58.556	
August	13.007		13.296		59.393	
September	12.870		13.210		59.021	
October	12.700		13.030		57.551	
November	13.125		13.354		58.917	
December	13.298		13.647		59.906	
Year	12.982		13.335		58.732	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	
February	28.290	32.920	August	29.966	
March	28.727	32.403	September	30.293	
April	29.445	32.976	October	30.475	
May	29.225		November	30.859	
June	29.322		December	32.913	
			Av. Year	29.725	

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287		4.214		13.225	
June	4.350		4.291		13.031	
July	4.321		4.188		12.563	
August	4.363		4.227		12.475	
September	4.342		4.215		12.781	
October	4.341		4.215		13.175	
November	4.370		4.252		13.047	
December	4.560		4.459		13.125	
Year	4.273		4.153		13.049	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124		4.974		21.975	
June	5.402		5.252		22.000	
July	5.402		5.252		21.969	
August	5.729		5.579		22.125	
September	5.796		5.646		22.906	
October	6.199		6.043		23.200	
November	6.381		6.231		23.188	
December	6.249		6.099		23.094	
Year	5.503		5.352		22.201	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77		15.02		15.08	
June	16.13		15.84		15.63	
July	16.40		15.90		15.96	
August	17.16		16.17		16.20	
September	18.44		16.80		17.03	
October	19.75		17.84		18.02	
November	19.90		18.37		18.09	
December	19.90		18.15		17.90	
Year	$17.46		$16.46		$16.40	

STOCK QUOTATIONS

COLO. SPRINGS May 3

Name of Comp.	Bid.
Listed:	
Acacia	.05½
Cripple Cr'k Con.	.02½
C. K. & N.	.13
Doctor Jack Pot	.07
Elkton Con.	.69½
El Paso	.80
Fannie Rawlins	.04½
Findlay	.02
Gold Dollar	.12½
Gold Sovereign	.03½
Isabella	.16½
Mary McKinney	.48
Pharmacist	.02½
Portland	1.05
Vindicator	.78½
Work	.04
Unlisted:	
Golden Cycle	1.50
United Gold Mines	.07½

SALT LAKE May 3

Name of Comp.	Clg.
Carisa	.48
Colorado Mining	.74
Columbus Con	.53
Daly Judge	4.03
Grand Central	1.25
Iron Blossom	1.02½
Little Bell	1.25
Little Chief	‡.45
Lower Mammoth	.57
Mason Valley	8.60
Maj. Mines	‡2.32½
May Day	.08½
Nevada Hills	.65
New York	.13
Prince Con	.82
Red Warrior	‡6.00
Silver King Coal'n	‡2.30
Sioux Con	.34½
Uncle Sam	.35
Victoria	‡2.00

SAN FRANCISCO. May 3.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Atlanta	.12
Belcher	.94
Best & Belcher	.25
Caledonia	.46
Challenge Con	.28
Chollar	.18
Confidence	1.00
Con. Cal. & Va	1.12
Crown Point	.95
Exchequer	.23
Gould & Curry	.28
Hale & Norcross	.40
Mexican	1.37
Ophir	1.47
Overman	.90
Potosi	.35
Savage	.36
Sierra Nevada	.32
Union	.34
Yellow Jacket	.95
MISC. NEVADA	
Belmont	2.80
Daisy	.07
Jim Butler	.15
MacNamara	.27
Midway	.27
North Star	.02
West End Con	.33
Atlanta	.14
Booth	.13
C.O.D. Con	.05
Columbia Mt.	.05
Comb. Frac.	.41
Great Bend	.02
Jumbo Extension	.28
Oro	.06
Red Hill	.04
Sandstorm	.04
Silver Pick	.09
St. Ives	.10
Tramps Con	.04

N. Y. EXCH. May 3

Name of Comp.	Clg.
Amalgamated	64½
Am. Agri. Chem	41⅜
Am.Sm.&Ref.,com	74¼
Am. Sm. & Ref., pf.	103
Anaconda	39
Bethlehem Steel	‡30
Col. & Hock. C. & I.	8⅞
Colo. Fuel & Iron	35⅝
Du Pont P'd'r, pf.	87⅛
Federal M. & S.	‡41
Great Nor., orectf.	61⅜
Nat'nalLead,com.	73
National Lead, pf.	107
Pittsburg Coal	17⅛
RepublicI&S,com.	32½
Republic I & S, pf.	96⅝
SlossSheffi'd,com.	72
Sloss Sheffield, pf.	‡117⅛
Tennessee Copper	26
Utah Copper	41⅜
U. S. Steel, com	79⅛
U. S. Steel, pf.	117⅝
Va. Car. Chem	55¼

N. Y. CURB May 3

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	19½
Braden Copper	4¾
B. C. Copper	6
Buffalo Mines	3½
Butte Coalition	18
Chino Copper	9¾
Cobalt Central	.10½
Combination Fra.	.43
Con. Ariz. Sm.	2
Cumberland Ely	9
Davis-Daly	1 1/16
Dominion Cop.	7
Ely Con	.50
El Rayo	2¾
Florence	3½
Gila Copper	5½
Giroux	6½
Gold Hill	1¾
Goldfield Con	7 1/16
Greene Cananea	7⅞
Guanajuato	1⅝
Guggen. Exp.	160
Kerr Lake	.08½
La Rose	4 1/16
McKinley-Dar-Sa.	.92
Miami Copper	20¼
Mines Co. of Am.	50
Montezu. of C. R.	2½
Mont. Shoshone	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	¾
Newhouse M. & S.	3½
Nipissing Mines	9¾
Ohio Copper	1¾
Pacific Sm. & M.	¾
Silver Queen	.12
Standard Oil	617
Stewart	1/32
Tonopah	7 3/16
Tonopah Ex.	.84
Tri-Bullion	⅞
Utah Apex	‡3½
W. Va. Wyo. Cop.	2 1/16
Yukon Gold	4⅜

LONDON May 4

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 3 3
Camp Bird	1 9 6
Esperanza	2 8 9
Tomboy	0 18 0
El Oro	1 7 0
Oroville	0 8 9

BOSTON EXCH. May 3

Name of Comp.	Clg.
Adventure	5½
Allouez	39½
Am. Zinc	23½
Arcadian	‡5½
Arizona Com	13
Atlantic	6
Boston Con	14⅞
Butte & Balak	9⅛
Calumet & Ariz.	59
Calumet & Hecla	574
Centennial	15
Con. Mercur	.10
Copper Range	64¾
Daly-West	8⅛
East Butte	7
Franklin	11
Granby	38½
Greene-Can.	7¾
Hancock	‡19½
Helvetia	‡3
Indiana	16
Isle Royale	13¾
Keweenaw	4
Lake	50½
La Salle	11
Mass	7
Michigan	4¾
Mohawk	46
Nevada	18⅜
North Butte	30
North Lake	10¼
Ojibway	6¼
Old Dominion	34
Osceola	135
Parrot	13¼
Quincy	76
Shannon	9
Superior	39
Superior & Bost.	9
Superior & Pitts.	11¼
Tamarack	49
Trinity	5¼
U. S. Smg. & Ref.	39½
U.S.Sm. & Re., pd.	48
Utah Apex	3
Utah Con	20
Victoria	3
Winona	6½
Wolverine	118
Wyandotte	2

BOSTON CURB May 3

Name of Comp.	Clg.
Ahmeek	.11
Bingham Mines	3½
Boston Ely	2½
Calaveras	5⅞
Champion	.08
Chemung	9⅝
Chief Cons	1⅜
Chino	10¼
Cons. Ariz.	2⅛
Corbin	.06
Cactus	2¾
Crown Reserve	3
First Nat. Cop.	2 1/16
Gila Copper	6⅝
Indiana	‡34½
Inspiration	6⅞
Majestic	.62
Nevada-Douglas	2
New Baltic	‡7½
Oneco	2 1/16
Ray Central	2¼
Ray Con	‡18⅝
Rawhide Coal	.25
Rhode Island Coal	6⅝
San Antonio	7
Shattuck-Ariz	‡25½
South Lake	4
Superior & Globe	.60
Trethewey	‡1.34
Tuolumne Copper	3¾
Vulture	9¼
Yuma	‡.90

‡Last quotation.

THE MINING INDEX

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COAL AND COKE

12,259 — ALASKA — Controller Bay Coal Field. George W. Evans. (Mines and Minerals, Mar. and Apr., 1910; 9½ pp., illus.) Location, extent of fields and quality of coal. Proposed transportation routes. 40c.

12,260—ALASKA COAL CASES, The. H. V. Winchell. (Eng. and Min. Journ., Apr. 23, 1910; 3 pp.) 20c.

12,261—ARGENTINA—Argentinien's Kohlenlager. Rasser. (Zeit. f. prakt. Geol., Feb., 1910; 2 pp.) 40c.

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12,264—CANADA—Le Bassin houiller de l'Alberta et de la Saskatchewan, Canada. E. Dulieux. (Bull. Soc. de l'Ind. Minérale, Feb., 1910; 27½ pp., illus.)

12,265—DUST—Some Results of Experiments Made to Test the Effect of Sprayers upon the Moisture of Main Roads at Brandon Colliery. T. L. Elwen. (Trans., North of England Inst. Min. and Mech. Engrs., Dec. 11, 1909; 8½ pp., illus.)

12,266—DUST EXPLOSIONS in Coal Mines. George S. Rice. (Trans. A. I. M. E., Mar., 1910; 5 pp.)

12,267—ELECTRICAL BREAKDOWNS in Collieries; Their Cause and Prevention. (Iron and Coal Tr. Rev., Mar. 25, 1910; 2⅔ pp., illus.) 40c.

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Corundum	"	.07@.10
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Emery, in kegs; Turkish flour	"	.01¾@.02
Grains	"	.03½@.04
Naxos flour	"	.01¾@.02
Grains	"	.03½@.04
Chester flour	"	.01½@.02
Grains	"	.03½@.04
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Grains, in kegs	"	.02¾@.03
Garnet, per quality	sh. ton.	25.00@35.00
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Italian, powdered	per lb.	.01¾@.01¾
Lump, per quality	"	.03½@.30
Rottenstone, ground	"	.02@.04
Lump, per quality	"	.05@.20
Rogue, per quality	"	.05@.30
Steel Emery, f.o.b. Pittsburg	"	.07½@.07¾
ACIDS—		
Acetic 28%	lb.	.02 7/16
Boric	"	.07
Hydrofluoric, 30%	"	.02¾@.03½
" 48%	"	.05½
" 52%	"	.06
" 60%	"	.09@.10
Hydrochloric acid, 20° per 100 lb.		1.25@1.50
Nitric acid, 36° to 40°	per lb.	.03½@.04½
Sulphuric acid, 50°, bulk per ton.		$12 up
60°, 100 lb. in carboys.		.85@1.12½
60°, bulk, ton		16.00@18.00
66°, 100 lb. in carboys.		1.00@1.10
66°, bulk, ton		18.00
Oxalic	per lb.	.07½@.07¾
ALCOHOL—Grain 95%	gal.	2.52@2.55
Denatured	"	.42
Refined wood, 95@97%	"	.52@.57
ALUM—Lump	100 lb.	$1.75
Ground	"	1.85
Chrome Alum	"	.04½@.05
ALUMINUM—Sulphate, com'l.	lb.	1.50@2.00
AMMONIA—24 deg. lb.	"	.04½@.05½
" 26 deg. lb.	"	.04¾@.05¾
AMMONIUM—		
Bromide	lb.	.28
Carbonate	"	.08@.08¾
Muriate grain	"	.05½@.06¼
Lump	"	.09¼@.09½
Sulphate, 100 lb.	"	2.75@3.00
Sulpho-cyanide com.	"	.25
" " chem. pure	"	.35
ANTIMONY—needle, lump	lb.	.04½@.04½
Oxide	"	.07¾@.08
ARSENIC—white	"	.02½@.02¾
Red, Outside brands	"	.07
Saxony	"	.07½@.08
ASPHALTUM—		
Barbadoes	per ton.	80.00@100.00
West Indies	"	20.00@60.00
Egyptian	lb.	.13@.18
Gilsonite, Utah ordinary	per ton.	32.00@40.00
Trinidad	"	20.00@25.00
California	per ton.	25.00@30.00
BARIUM—		
Carb. Lump. 80@90%	lg. ton.	26.00@35.00
Precipitated, 96@98%	"	34.00@36.00
Powdered, natural	lb.	.02@.02½
Chloride com'l	ton.	33.00@35.00
Nitrate powdered, in casks	lb.	.05@.06½
Blanc Fixe, dry, bbl.	per lb.	.02¾@.04
BARYTES—		
Am. Ground	sh. ton.	12.00@15.00
Floated	"	17.00@19.00
Foreign floated	"	20.00@23.00
BLEACHING POWDER—35% 100 lb		1.20@1.40
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.		4.00@4.25
BONE ASH	lb.	.02¾@.04
BORAX, sacks	"	.03¾@.05
CALCIUM—Acetate, gray, 100 lb.		1.75@2.00
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Chloride, f.o.b. N. Y.	"	11.00@14.10
CEMENT—Slag cement	bbl.	.75@1.25
Portland, Am. 500 lb	"	1.50@1.60
Foreign	"	2.25@2.90
"Rosendale," 300 lb.	"	.85
(in sacks)	"	.65
CHROME ORE—		
New Caledonia 50% ex. ship N. Y.	per lg. ton.	14.00@16.00
Bricks, f.o.b. Pittsburg, per M.		175.00
CLAY, CHINA—Am. common ex-dock, N. Y.	ton.	8.00@9.00
Foreign	"	11.50@18.00
COBALT—Oxide	lb.	.80@.85
COPPERAS—Bulk	100 lb.	$0.55
In bbls	"	.65@.80
In bags	"	.60@.75
CRYOLITE (carload)	lb.	.06½@.07
FELDSPAR—Ground	sh. ton.	6.00@14.00
FIRE BRICK—		
American	per M.	30.00@40.00
Imported	"	30.00@45.00
St. Louis	"	16.00
Extra	"	20.00@23.00
Special extra	"	30.00@35.00
FIRE CLAY—F.o.b. St. Louis.		
St. Louis, extra quality	per ton.	5.00
" ordinary	"	2.50
FLUORSPAR—		
Domestic f.o.b. Pittsburg: Lump	ton.	8.00@10.00
Ground	"	12.00@14.00
Foreign crude ex. dock	"	8.50
FULLER'S EARTH—Lump, 100 lb.		.80@.85
Powdered	"	.80@.85
GRAPHITE—Ceylon.		
Flying dust, finest to best	lb.	.02@.04
Dust	"	.02½@.05
Chip	"	.04@.08
Lump	"	.05½@.12
Large lump	"	.08¼@.10½
GYPSUM—		
Fertilizer	sh. ton.	5.00
Ground	"	4.00@7.00
INFUSORIAL EARTH—		
Ground Am. Best	lb.	.01¾@.02½
German	"	.02½@.02¾
LEAD—Acetate (sugar of) brown,	lb.	.07¾@.08
Nitrate, com'l	"	.09@.10
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	7.50@8.50
Calcined, powdered	sh. ton.	26.00@37.00
Brick, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	.90@1.25
Sulphate (Epsom salt)	100 lb.	.90@1.00
MANGANESE—		
Foreign, crude, powdered: 70@75% binoxide	lb.	.01@.01¼
75@85% binoxide	"	.01¼@.01½
85@90% binoxide	"	.01½@.04
90@95% binoxide	"	.06½
Ore, 80%-85%	sh. ton.	16.00@32.50
MARBLE—Flour	sh. ton.	7.00@9.00
MINERAL WOOL—		
Slag, ordinary	sh. ton.	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, normal	lb.	.08 and up
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		.47
Sulphate, single	lb.	.10½@.11
Sulphate, double	"	.05⅞@.08
NITRATE OF SODA—		
100 lb. 95%		2.07½@2.15
95% for 1910		2.07½@2.15
96% is 2¼@7½c. higher per 100 lb.		
OZOKERITE—best	lb.	.14@.17
PAINTS AND COLORS—		
Litharge, Am. powdered	lb.	.06¼@.06¾
English glassmakers'	"	.08¼@.09¼
Lithophone	"	.03½@.07
Metallic, brown	sh. ton	16.50@22.00
Red	"	14.00@18.00
Ocher, Am. common	"	8.50@9.00
Best	"	12.00@15.00
Dutch, washed	lb.	.02¾@.03
French, washed	"	.01½@.02
Paris green, pure, bulk	"	.17½@.20½
Red lead, American	"	.06¾@.07
Foreign	"	.08½@.09¼
Turpentine, spirits bbl., per gal.		.62½@.63
White lead, Am., dry	lb.	.06@.06½
American, in oil	"	.07@.07½
Foreign, in oil	"	.09@.09¾
Zinc white, Am. extra dry	"	.05½@.06½
French, proc's, red seal, dry	"	.07½@.08
French, process, green seal, dry	"	.10@.10½
PHOSPHATES—Acid		.55@60c. per unit
*Fla., hard rock 77%		7.00@7.50
land pebble 68%		3.75@4.00
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. land rock 60%		3.50@4.00
POTASSIUM—		
Bicarbonate crystal	lb.	$.07½
Powdered or granulated	"	.08
Bichromate, Am.	"	.07¾@.08
Scotch	"	.10¼
Bromide	"	.20
Carbonate (80@85%)	"	.03½@.04½
Caustic, ordinary	"	.05½
Elect. (90% KOH)	"	.06@.06½
Chloride (muriate), 100 lb.		1.90
Chlorate, powdered	"	.08½@.09½
Crystals	"	.09@.09¾
Cyanide (98@99%) Carloads (30,000 lb.)	"	18c.
5-ton lots		18½c.
Less than 5 tons		.19
Kainite, long ton, bulk, 8.50; bags,		9.25
Permanganate	lb.	.09½@.10½
Prussiate, yellow	"	.13@.13¾
Red	"	.29@.32
Sulphate (basis 90%)	100 lb.	2.18@2.21
PYRITE—		
Domestic, non-arsenical, furnace size, f.o.b. R. R.	per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines		10¾@11c.
Imported, non-arsenical, furnace size, ex-ship, per unit		.12½
Imported, arsenical, furnace size, ex-ship, per unit		.11½@.12
Imported fines, arsenical, ex-ship, per unit		.09@.09½
Imported fines, non-arsenical, ex-ship, per unit		10½@11c.

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore is delivered in large lumps.

SALT—N. Y. com. fine 280 lb.	bbl.	.72@1.13
N. Y. agricultural	sh. ton.	3.80@4.50
SALTPETER—Crude	100 lb.	4.00@4.50
Refined, crystals	"	5.00@5.75
SILICA—		
Ground quartz, ord'ry.	lg. ton	7.00@15.00
Silex, ground	"	7.00@15.00
Silex, floated	"	35.00@40.00
Lump quartz	"	5.00@5.50
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.33½@.36¾
SODIUM—Acetate	lb	.04½@.05
"Alkali," per 100 lb., 58/48		.90@.95
Bicarb. soda, per 100 lb		1.00@1.30
Soda, caustic, per 100 lb., 78/60		1.72½@1.85
Soda, caustic, powdered		.02½@.03
Salt cake, per 100 lb., bulk		.50@.60
Salt cake, bbl		.85@.95
Soda, monohydrate, per lb.		1.30@1.75
Bichromate	lb.	.05⅝@.06½
Bromide	"	.20
Chlorate, com'l	"	.08¼@.09½
Cyanide, 120-130% KCN, per 100% Carloads (30,000 lb.)	lb.	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	.20
Hyposulphite, Am.	"	1.30@1.50
Phosphate	100 lb.	2.10@2.40
Prussiate	"	.08½@.09
Sal soda, f.o.b. N. Y.	"	.60@.75
Foreign, f.o.b. N. Y.	"	.80@1.00
Silicate, com'l	"	.65@1.00
Sulphate, com'l (Glauber's salt)	100 lb.	.60@.80
Sulphate, com'l, calcined		.65@.85
STRONTIUM—Nitrate	lb.	.07@.08
SULPHUR—Louisiana (prime) to New York	lg. ton.	22.00 up
To Boston, Philadelphia or Baltimore	"	22.50 up
Roll	100 lb.	1.85@2.15
Flour	"	2.00@2.40
Flowers, sublimed	"	2.20@2.60
Powdered commercial, bags		1.55
Sicilian, extra qual., unmixed seconds, crude brimstone to New York	lg. ton.	$22.00
TERRA ALBA—Fr.&Eng.	100 lb.	.70@1.00
TALC—Domestic	sh. ton.	12.00@20.00
French	"	15.00@25.00
Italian, best	"	30.00@40.00
TIN—Bi-chloride, 50°	lb.	.10
Crystals	"	.22½@.24
Oxide, lb	"	.37@.40
URANIUM—Oxide	"	2.20@4.25
ZINC—Chloride sol., com. 20°	"	.02½
Chloride, granular	"	.04@.04½
Dust	"	.06½
Sulphate	"	.02@.02½

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output as a matter of private contract.